FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

First Aeronautical Weekly in the World. Founded January, 1909

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1151. (Vol. XXIII. No. 3.) JANUARY 16, 1931 [Weekly, Price 6d. Post free, 7½d. Abroad, 8d.

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY W.C.2.
Telephone: (2 lines), Holborn 3211 and 1884.
Telegrams: Truditur, Westcent, London.

Annual Subscription Rates, Post Free.
United Kingdom .. 33s. 0d. United States .. $8·75.
Other Countries .. 35s. 0d.*

* *Foreign subscriptions must be remitted in British currency* (*See last Editorial Page.*)

CONTENTS

DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1931
Jan. 17 Association Football: R.A.F. v. Corinthians, Wycombe.
Jan. 22 "Aeroplane Controls, Faults and Diagnosis," Lecture by W. James, before R.Ae.S., Gloucester and Cheltenham Branch.
Jan. 22 "Deck Flying," Lecture, by Sqdn.-Ldr. W. R. D. Acland, before R.Ae.S.
Jan. 22 "Model Aeroplanes," Lecture, by W. Rigby, before Westland Aircraft Soc.
Jan. 28 "Glider Construction," Lecture, by C. H. Lowe-Wylde, before London Gliding Club
Jan. 28 Association Football: R.A.F. v. Football Assoc. XI., Uxbridge.
Jan. 29 "Development and Construction of Sailplanes and Gliders," Lecture, by Herr A. Lippisch, before R.Ae.S.
Jan. 29 "Machining and Working of Stainless Steel," Lecture, by R. Waddell, before Westland Aircraft Soc.
Jan. 30 "Gliding and Soaring," Lecture, by Col. the Master of Sempill, before R.Ae.S., Hull.
Feb. 5 .. "Wapiti in Australia," Lecture, by Sqdn.-Ldr. C. T. Anderson, before Westland Aircraft Soc.
Feb. 6 .. De H. Aeronautical Technical School Ball, at Portman Rooms.
Feb. 11 "Future of Aeroplane Design for the Services," R.U.S.I. Lecture, by C. R. Fairey. 3 p.m.
Feb. 11 Association Football: R.A.F. v. Civil Service, Uxbridge.
Feb. 12 "Air Navigation," Lecture, by Capt. N. Macmillan, before R.Ae.S. and G.A.P.A.N.
Feb. 12 "Spinning," Lecture, by S. Scott-Hall, before Westland Aircraft Soc.
Feb. 17 London Aeroplane Club Dinner and Dance, Park Lane Hotel.

INDEX FOR VOL. XXII

The 8-page Index for Vol. XXII of "Flight" (January to December, 1930), is now ready and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C.2, price 1s. per copy, net, (1s. 1d. post free).

EDITORIAL COMMENT

BY a somewhat curious coincidence, FLIGHT published, last week, the first of two articles (the second will be found in the present issue) dealing with what Holland is doing in the matter of linking up by air with her colonies in the East Indies. The coincidence lies in the publication of these articles at the precise moment when the appointment of a new Director of Civil Aviation is announced. Lieut.-Col. Shelmerdine, whose appointment will, incidentally, be welcomed on all sides, will be faced, immediately upon assuming office, with many matters of urgency which the interim since the regrettable death of his predecessor, Sir Sefton Brancker, has of necessity caused to accumulate. But we venture to think that none of the matters awaiting his attention is of greater national, and, indeed, Imperial importance than a reconsideration of the whole subject of Imperial air routes. The preparatory work on the extension of the air route from Cairo towards the Cape has been all but completed, and the general policy to be followed has been settled. Apart from the possibilities, as yet fairly distant, of a direct air service to Canada, the most pressing need of the Empire in the immediate future is that of adding Australia to the network of lines.

On to Australia

Naturally, we have no means of knowing to how great an extent Col. Shelmerdine's appointment was influenced by the fact that he has, for some three years, been Director of Civil Aviation in India. That the fact was duly considered may be taken for granted. And in the planning of the future extension

of the air route from Karachi to Australia, the conditions, political as well as geographical, of India, must necessarily play an important part. His stay in India will have given Col. Shelmerdine a very good insight into Indian affairs, and his "local" knowledge of people and conditions should be of inestimable value to the new D.C.A. in dealing with the numerous problems which are bound to arise.

At present, India is the "missing link" in the chain. Australia already has some extremely useful internal air lines, and the Imperial Airways route from London to Karachi is probably running with as good results as any obtained anywhere. But the two cannot link up until the question of the Indian sections has been settled. Col. Shelmerdine knows, none better, what obstacles will have to be overcome. But overcome they must be. It is intolerable that the air route from which the Empire has, probably, more to gain than from any other, should be hung up because agreement cannot be reached. Hitherto there have been two fairly good excuses for the delay: the difficulties of coming to an agreement with India, and the hope that airships might, with one blow, so to speak, cut all Gordian knots by making very long non-stop stages possible. The deplorable calamity which resulted in the loss of R 101, with a number of valuable lives, has postponed indefinitely this second possibility, and we can no longer afford to wait for airships to prove their worth. Whatever airship policy Great Britain may ultimately decide upon, we must go ahead planning our immediate developments, using as a basis for the planning not such aircraft as may exist in ten years' time, but such as we already have available, or which are technically within sight. The lamentably slow airship progress of the last few years has already set us back a good deal, but if action is taken immediately, we still have time to retrieve the lost opportunities. But action must be taken *at once*.

Holland has set an example which should make us, as a great nation, ashamed of ourselves. While we vacillated and held conferences which never produced anything beyond verbiage, Holland acted. While we hung fire, in the hope that the airship might one day prove capable of doing our long-distance air-mail work, Holland made use, and right good use, of such heavier-than-air equipment as she had, and the capabilities of which were known to within a very little. The benefits which Holland will derive from her linking up her East Indian possessions with the motherland are, proportionately, smaller than those which Great Britain and Australia would enjoy if linked together by an efficient air service. Yet Holland has not hesitated to venture forth. And the irony of the situation is that, if Great Britain does not bestir herself very soon, it will be Holland or France, and not Great Britain which will provide the "missing link" in the British chain to Australia. If Col. Shelmerdine is a good enough "smith" to forge that link during the next year or two, he will have done more than any single man towards establishing real Empire aviation.

❖ ❖ ❖

"Showing the Flag"

One may, or one may not, regard the Italian flying-boat squadron flight to South America as having been justifiable. That depends upon how large a percentage of casualties one would regard as "reasonable" for a flight of this nature. But of the impression which the flight has created in South America generally there can be but one opinion. It should be borne in mind that we have here Latin "showing off" to Latin. We, with our more phlegmatic temperament, might be less enthusiastic. We might say, and with a great deal of truth, that some of the British flying-boat cruises to the East have been as meritorious. So they have. And, from a technical point of view, probably a great deal more instructive. But there is no gainsaying the mass-effect which the large number of machines has upon the general public, nor the convincing quality lent to that effect by the fact of crossing the breadth of the South Atlantic. And as a daring gesture, a "do or die" piece of showmanship, the flight has probably been worth while. To British aviation, the significance of the flight lies in the nearness of the opening of the Buenos Aires exhibition. That the flight has set the whole of South America talking aviation there can be no doubt. That a great admiration for Italian aviation has been aroused by the flight is equally certain. And as the Buenos Aires exhibition is entirely a British affair, the fact that Italy should have, so shortly beforehand, made such excellent aviation propaganda cannot but be of benefit to those British aviation firms which will be exhibiting and demonstrating aircraft at the show. And so, once more, British aviation will owe a great deal to that most picturesque of all air ministers, General Italo Balbo. Likewise will British aviation circles sympathise sincerely with General Balbo, and with Italian aviation in general, in the loss of some of the gallant personnel who took part in this memorable flight.

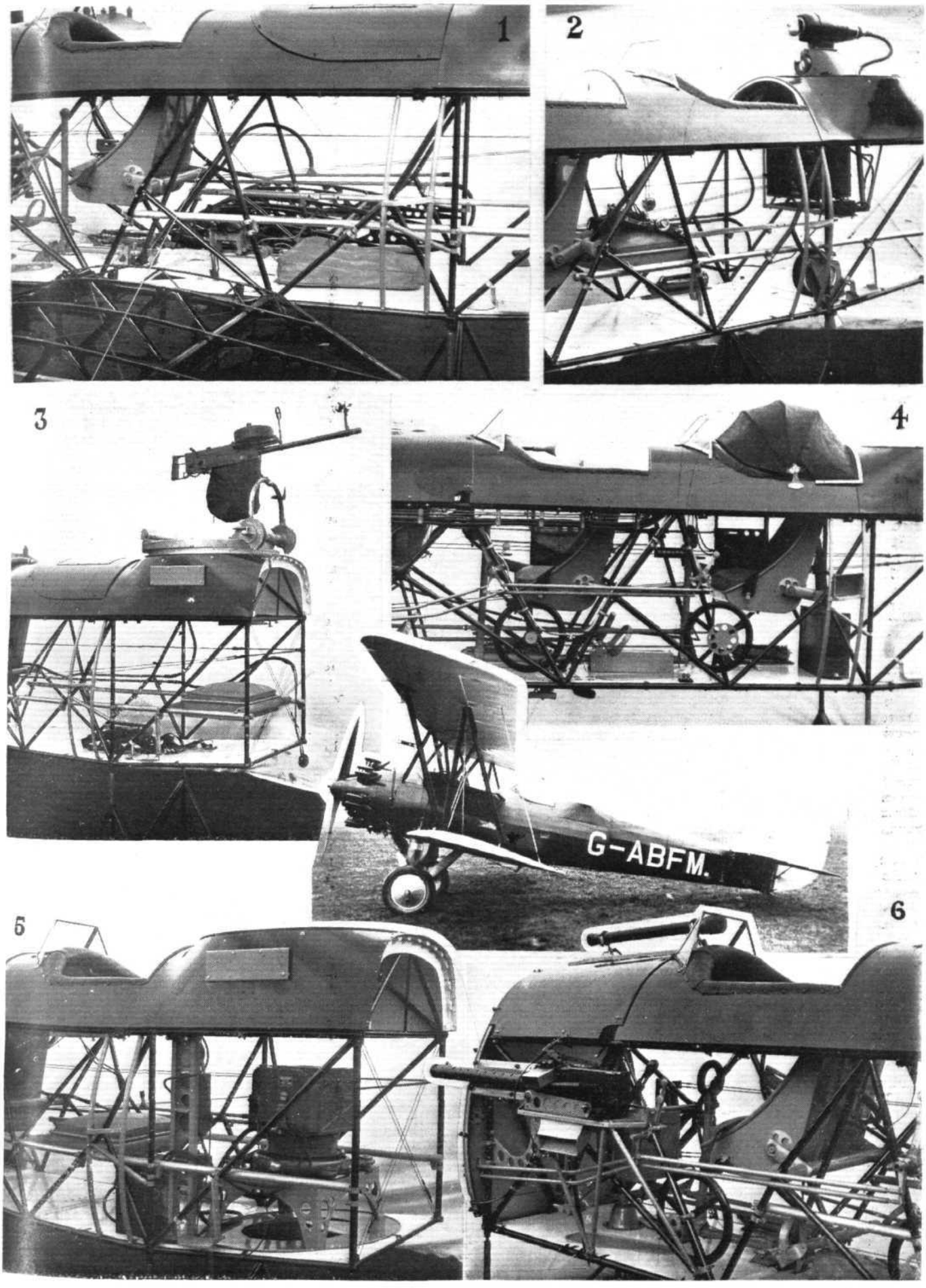
▣ ▣ ▣ ▣

Spain's Air Force Suppressed

As a result of the recent revolt at the Cuatro Vientos aerodrome, a Royal Decree, dated January 8 and signed by the King of Spain, suppresses the Spanish Air Force as at present constituted, and within a month all officers and men will cease to wear the aviation uniform, and will be returned to their regiments. The air force will then be completely reorganised.

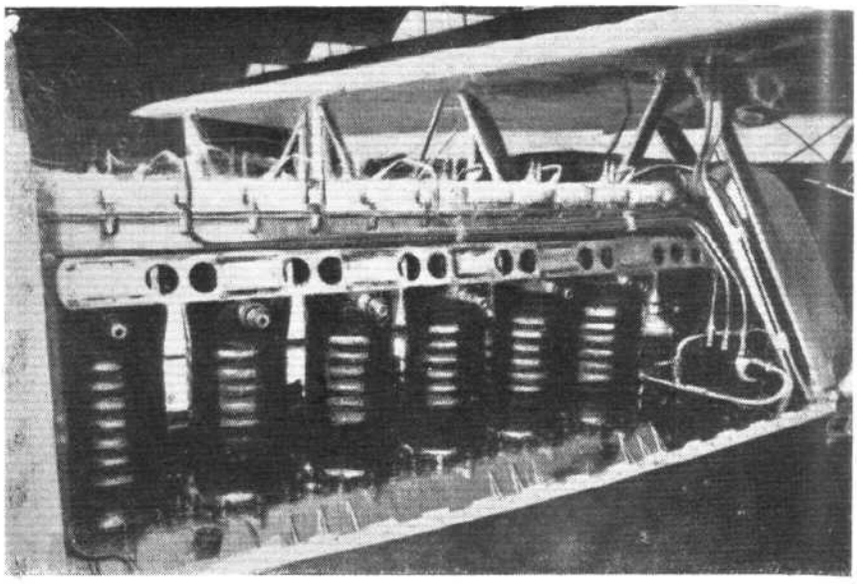
Changes in the Command of France's Air Forces

ONE of the first acts under the new French Air Minister, M. Painlevé, has been a reorganisation of the High Command of France's Aerial Forces. By a new decree issued by M. Painlevé the system hitherto in force of having two Inspector-Generals, one for the naval air force and one for the military, one official will in future be in charge of the inspection of material for both army and navy. Another innovation is the creation of a new post under the title Chief of Staff of the Aerial Forces. The appointment to this post has fallen to General Barés. Under him the new Chief of Staff will have two sub-chiefs, one of whom will deal with the naval section and the other with the army section. Time alone can show whether the new system will work better than did the old.



VERSATILITY: The Avro Advanced Training Aeroplane, Type 626, has now been equipped in six distinct styles, which between them make the machine suitable for specialised instruction in: 1, prone bombing; 2, wireless; 3, Lewis gun (observer's); 4, "blind" flying; 5, photography; 6, Vicker's gun (pilot's). In addition, the machine is, of course, equipped for dual instruction in flying, and instruction in navigation, while by fitting floats the Trainer is suitable for instruction in seaplane flying. (FLIGHT *photos*).

FIAT DIESEL-TYPE ENGINE



ONE of the features of the big Aerial Pageant held in Rome last year was the successful performance of a Fiat aeroplane fitted with a Diesel-type aero engine which has been produced by the Fiat firm.

On the morning of the Pageant this machine, the first Italian aeroplane propelled by a crude-oil engine, left the Fiat flying ground in Corso Francia, Turin—the start being witnessed by several of the firm's directors and engineers. The preliminary trials of the engine, both on the bench and in flight, were highly successful, but a flight of a certain distance and duration was needed to be sure of complete success.

The aeroplane arrived in Rome at the Littorio airport at 2.42 p.m., then flew over the Littorio field during the Pageant. The pilot was Renato Donati, who is well known as the holder of several world's records. He was accompanied by the mechanic Cappannini.

It is, of course, common knowledge that the Fiat firm has been building crude oil engines of the Diesel type since 1907. From the Fiat heavy-oil engine works in Turin have been turned out, and are still being turned out every year, ship's engines for every nation, both for war and for mercantile vessels. This production, thoroughly Italian in design and construction, holds third place in the statistics of foreign nations for the total horse-power constructed; calculated on a basis of world production. Besides marine engines, the Fiat Company has also designed and built high-power Diesel engines for industrial use, as well as high speed Diesel engines for special purposes, such as on locomotives, particularly interesting to light and colonial railway undertakings. The problem of the application of the crude oil engine to motor vehicles is also receiving close attention from the Fiat organisation. In the field of aviation, however, the experiments which the Fiat Company has been carrying through for some years with the close collaboration of their engineers in both the crude oil engine and aeroplane departments, have already given excellent results, as is clearly demonstrated by the Pageant flight.

As is well known, crude oil claims three advantages over petrol: it is non-explosive, non-inflammable and costs about five times less than petrol; and therefore permits of the construction of engines of greater thermal efficiency, that is, with a lower specific fuel consumption.

Consequently, for aviation, the crude oil engine offers these advantages over the petrol engine:—

(1) Greater constructional simplicity; there are no carburettors or ignition apparatus (magnetos and sparking plugs); the pumps and injectors that take their place being simpler and more positive in action.

(2) Improved thermal efficiency, and therefore a lower fuel consumption per h.p.-hour, and consequently a greater radius of action.

(3) The use of a cheaper fuel.

(4) No risk of fire.

These advantages are sufficient to make the crude oil engine especially suited for commercial air lines, and there can be no doubt that the future of trans-oceanic aerial communication is bound up with the development of this type of engine, the advent of which in Italy undoubtedly marks a memorable date in the history of Italian aviation.

In order to have an engine of this type available in the shortest possible time for trials, not only on the bench, but also in actual flight, the Fiat Company instead of building a single cylinder experimental engine, preferred to take an existing aero engine of known characteristics, and convert it into a direct injection Diesel engine. An "A.12 bis" engine was chosen for this experiment.

Constructional Features

The "A.N.1" engine is identical in general outline and overall dimensions with the "A.12 bis" type from which it is derived by means of the alterations above mentioned. It has six cylinders in line with a bore of 140 mm. and a stroke of 180 mm. It is water cooled and the only auxiliaries necessary to its working are the fuel pumps, lubricating pumps and water circulating pump. There are no carburettors, which are replaced by the aforementioned fuel pumps; neither are there any magnetos, the ignition of the explosive mixture taking place automatically through the high temperature of the compressed air, at the moment of injection of the fuel into the cylinder.

The crankcase, oil sump, crankshaft, lubricating and cooling systems and their fittings do not differ from those ordinarily employed in the usual types of aero engines. The outstanding features of the new type of engine are: the cylinders, pistons, valve gear, fuel pump and fuel atomiser.

Cylinders.—These are of the usual steel sleeve type, with valve chambers and water jacket welded on. They are proportioned to the higher pressures they have to withstand, and in their heads have seats for two inlet and two outlet valves, whilst in the centre is the seating for the fuel atomiser.

Pistons.—Of aluminium and of specially designed shape to form a good combustion space.

Valve Gear.—The inlet and exhaust valves are actuated directly off two parallel camshafts, according to the system used in the latest types of aero engines. The inlet valves communicate directly with the atmosphere and draw in air only, and not an explosive mixture as is the case with petrol engines.

The fuel is injected into the cylinders through the atomiser just when the piston has nearly finished its upward stroke, compressing the air previously drawn in. The atomiser opens automatically through the pressure of the fuel which it injects into the cylinder in a very finely divided state, so as to facilitate its rapid ignition and complete and efficient combustion.

Fuel Pumps.—There are six fuel pumps operated by cams and divided into two groups of three. They are instruments of great precision, as they have to send into each cylinder the minute quantity of fuel required, according to the load on the engine, and under extremely high pressure, as much as 200 or 300 atmospheres. Provision is made for regulating the quantity of fuel delivered by the pumps and also the length of the injection period; there is also an arrangement for varying the timing of the injection.

Control of the engine in flight is therefore obtained solely through the fuel pumps.

Starting.—The engine is started by compressed air, through automatic valves on the cylinders and a distributor in the same way as with petrol engines.

Results of Tests.—In the lengthy bench tests to which it was subjected, the engine gave the following results:—

Normal output, 180 h.p.; normal speed, 1,600 r.p.m.; maximum output, 220 h.p.; maximum speed, 1,700 r.p.m.

At the maximum power output, the mean effective pressure (m.e.p.) is 100 lb. per sq. in., remarkably high even for the usual slow running type of Diesel engine.

This engine works with crude oil, such as is normally used for four-stroke Diesel engines, density 0·86. The consumption of fuel under normal load is about 0·42 lb. per h.p.-hour, and remains practically constant at both higher and lower loads.

THE BRAIN CENTRE OF A MODERN AIRCRAFT

Cockpit Equipment of the "Balair" Fokkers

THE equipment of the cockpit of a modern comparatively large air liner is probably one of the most vital factors in its successful operation. The Swiss Air Traffic Company "Balair," have ensured that their Fokker F.VII B-3m.'s (3 "Whirlwind" 300 h.p. engines) are fitted up in a manner which will give the pilots every assistance they can have. As the photo shows, the arrangement of the various instruments is thoroughly practical, and while the equipment is extensive there is no over-crowding, so that the cockpit appears to be very roomy and comfortable.

In spite of the fullness of the equipment, it is worth noting that the view in this type of machine is exceptionally good and the wide clear windows should make flying easy in any weather conditions.

A view of the cockpit is shown on the right, at the top of which, in the centre, are the oil pressure gauges for the three engines. The group below these, reading from left to right, comprises a longitudinal inclinometer, a controller of flight (consisting of 3 parts, viz.: an airspeed indicator, a bank and turn indicator, and a transverse inclinometer) and an altimeter.

A little lower, to the left of the photo, are the knobs for regulating the carburettor heating and the oil radiator of the left outboard engine; next to these the compass, and to the right the two knobs for regulating the carburettor heating and the oil radiator of the right outboard engine.

Below are the switches for the Scintilla magnetos of the three engines, and a little lower again, the throttle levers. The three knobs on the left operate the throttles, while the three knobs on the right are for regulating the altitude control for the three engines.

Finally, at the bottom are the knobs for regulating the carburettor heating, and the oil radiator of the centre engine.

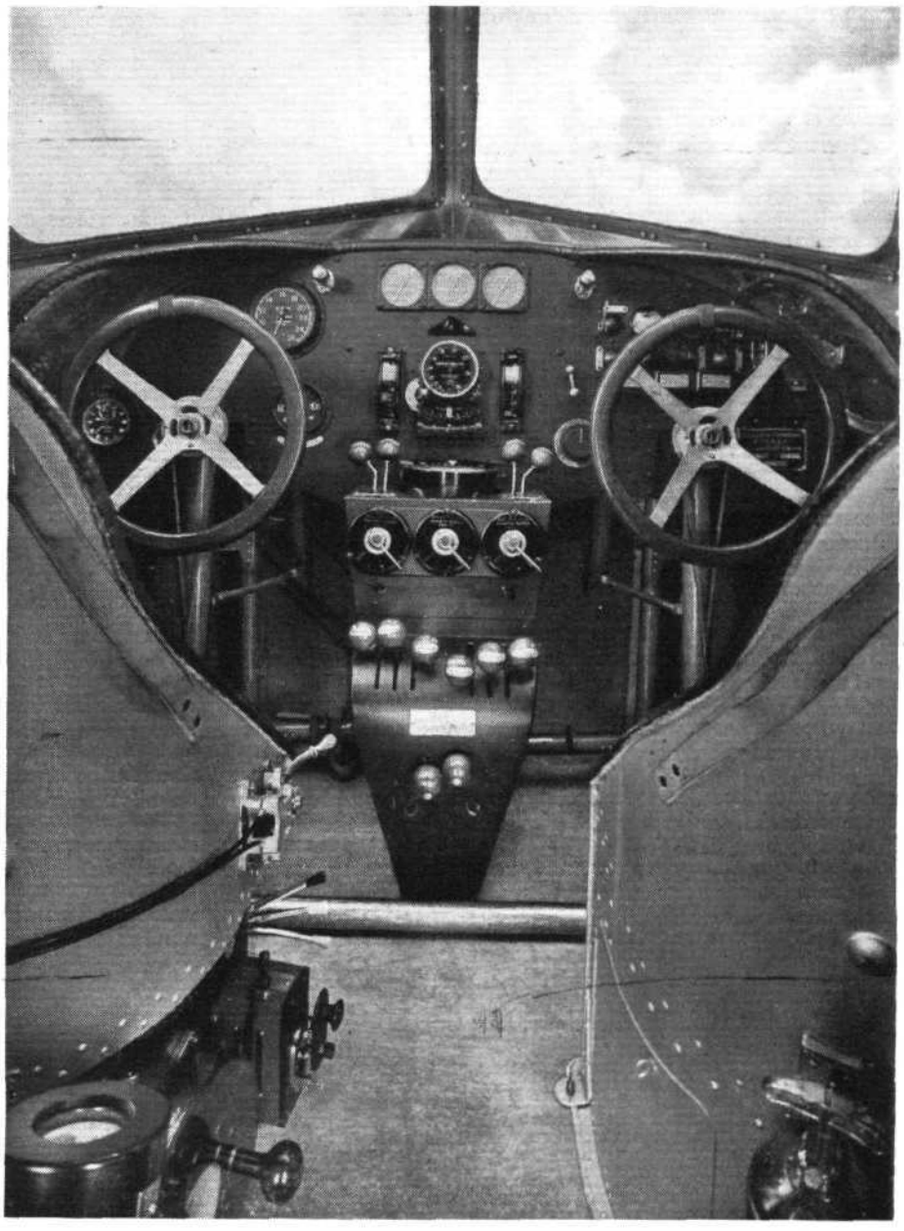
On the left hand side of the instrument board, under the microlamp at the top, will be seen the revolution counter and underneath the oil-thermometer for the centre engine. The revolution counters and oil-thermometers for the outboard engines are mounted on their respective power-eggs, clearly visible for the pilots.

On the extreme left, visible between the spokes of the steering wheel, is the clock, which also indicates in minutes the duration of each flight. To the left of the spindle of the steering wheel is the manometer which indicates the pressure of the pneumatic brakes on the wheels. The pedals for operating these brakes, which can be applied to each wheel separately, are mounted on the rudder bar. Part of the pedal for the right-hand wheel brake can be seen a little to the left under the throttle lever for the left outboard engine.

There is also a microlamp at the top of the right half of the instrument board. The first row under the lamp comprises (from left to right) the contact for operating the left-hand Holt landing flare, the voltmeter for the lighting installation, the main switch, and the contact for operating the right-hand Holt landing flare.

In the next row are (from left to right) the switch for the voltmeter, the switch for the navigation lights, the control lamp of the generator, the switch for the cabin lights, the switch for the microlamps and a plug contact.

Below these are the fuses for the navigation lights, cabin lights and Holt flares, besides two holders for spare fuses.



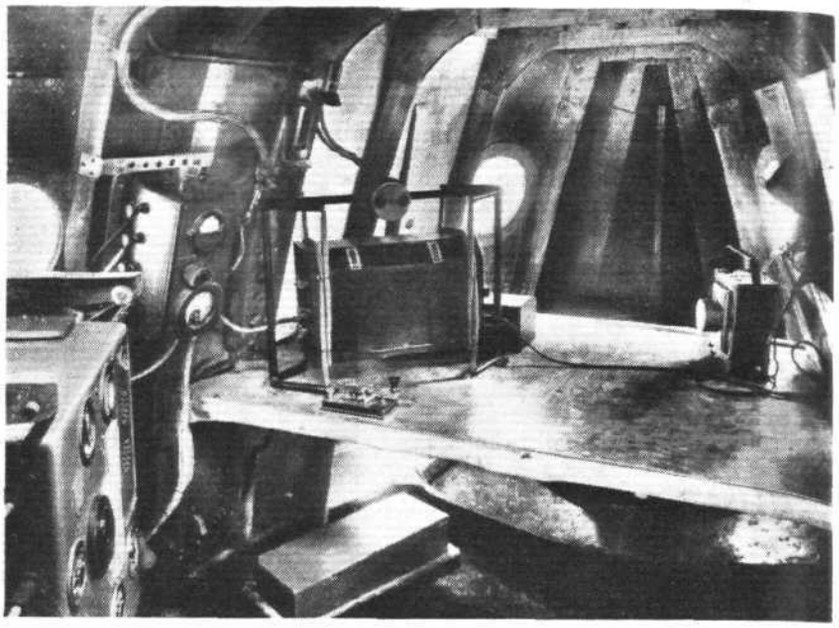
To the left of this row is the crank for the starter magneto, and under this the high tension switch.

At the bottom to the left of the photo are the various wireless levers, etc., comprising, from top to bottom, a switch for regulating wavelengths, and the remote control unit of the Marconi transmitter-receiver, type AD6m. Lower down on the case is the switch and the knob for connecting up the telephone set, and the manipulating key. A little to the fore is the aerial winch and in the corner on the extreme left is the aerial ammeter.

Finally, in the right-hand bottom corner is the Pyrene fire extinguisher.

The layout is indicative of careful planning.

ITALIAN SQUADRON'S ATLANTIC CRUISE



The wireless cabin of the Savoia S.55 flying-boat. Wireless played an important part throughout the flight.

SUBSEQUENT reports of the remarkable flight by the squadron of Italian flying boats from Africa to Brazil —which we recorded in last week's issue— indicated that the "raid" was not accomplished, after all, without disaster. It appears that five lives were lost at the very start of the flight from Bolama, but news of the disaster was withheld until the other machines had accomplished their task.

The loss of five lives was the result of the crashing of two of the twelve seaplanes, and the fact that twelve machines actually took part in the Atlantic crossing (ten of which reached their destination) is explained by the statement received later that at the last moment Capt. Donadelli and Lieut. Tencci, the commanders of the two repair machines, were granted permission to take part in the flight to Brazil. Thus, although two machines were destroyed at the start, twelve actually took off from Bolama on Tuesday, January 6 (at 1.29 a.m. G.M.T.)

In a message to Sig. Mussolini, Gen. Balbo gave a graphic account of the flight. The take-off, which was effected in darkness and fog, was made in four flights of three machines each, which were painted red, black, white and green, respectively. The black flight, commanded by Gen. Balbo, was the first to start, and it was not able to see the take-off of the other flights. Gen. Valle experienced difficulty in taking off and was obliged to return to reduce his load, but took off again an hour later, rejoining the other machines near the Brazilian coast.

The seaplane commanded by Capt. Recagno, after having successfully taken off, lost flying speed, and was obliged to come down in the sea, smashing a float, which caught fire. Boats duly rescued the crew with the exception of the mechanic, Fois, who was found to be missing.

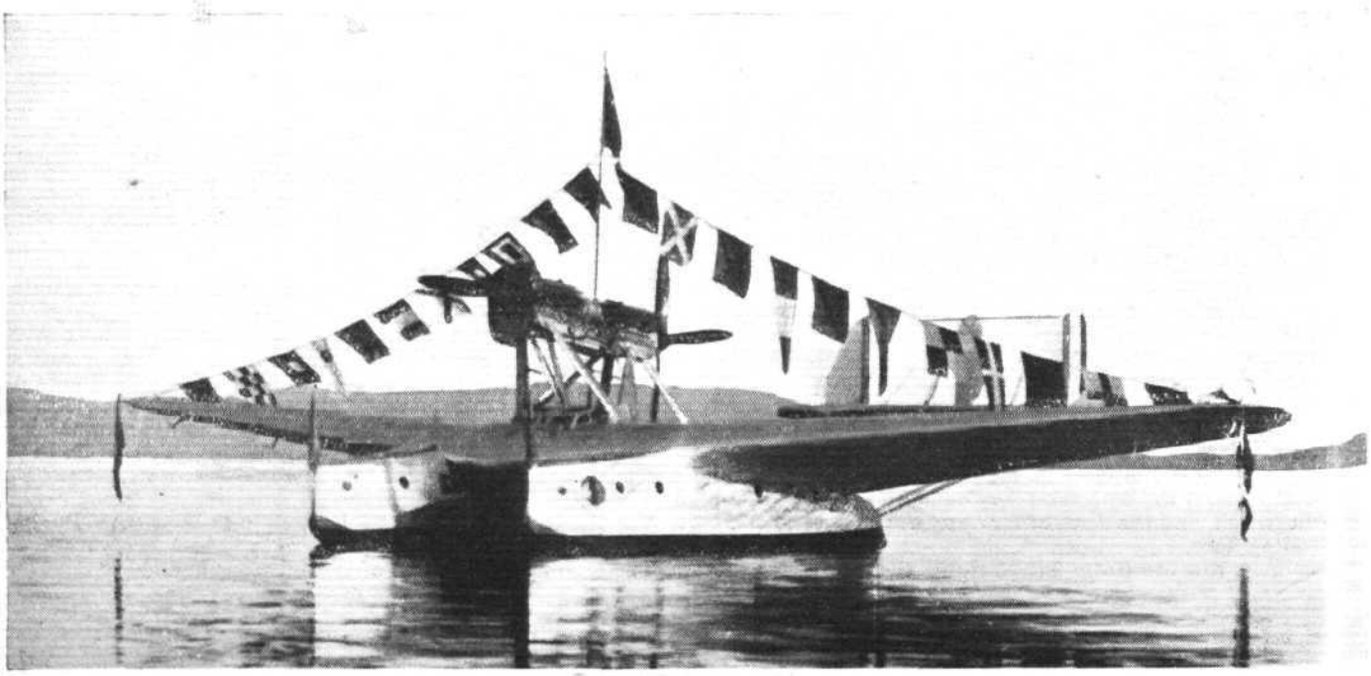
A second machine, commanded by Capt. Boer and by the second pilot, Lieut. Barbicinti, in spite of exceptionally skilful piloting, was obliged for some unknown cause to come down in the sea a few minutes after taking off. It immediately burst into flames and was destroyed in a few seconds. The four airmen on board, Capt. Boer, Lieut. Barbicinti, Serg Nensi and wireless operator Imbastari, perished.

Gen. Balbo did not learn of these disasters until much later, and meanwhile he and his companions were battling with fog and darkness. After six hours' flying they got the first light of dawn, and all twelve machines were then flying in perfect formation. During the day the squadron spread out so as to climb above the banks of rain clouds.

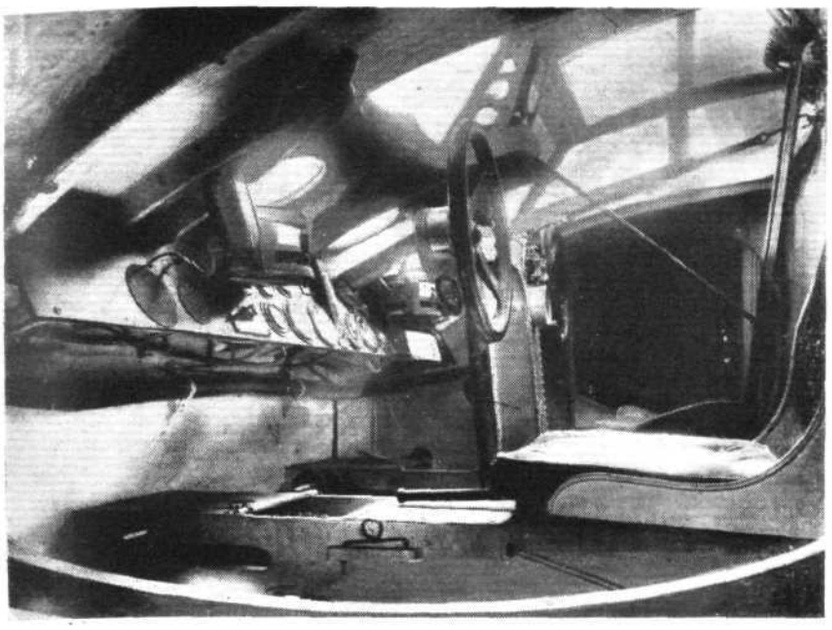
After nine hours' flying, Gen. Balbo received an S.O.S. from the machine commanded by Capt. Baistrocchi, who had been forced down into the sea with a damaged radiator. Gen. Balbo communicated the position of the machine to a naval division, which sent a unit to take the seaplane in tow.

The machine commanded by Capt. Donadelli also suffered similar damage, and was obliged to come down 370 miles from the island of Fernando Noronha. The machine was also taken in tow by a naval unit.

After 15 hours' flying the airmen sighted the island of Fernando Noronha, and after 18 hours the Brazilian coast came



AVANTI SAVOIA! One of the Savoia S.55 flying-boats which carried out the successful formation flight across the Atlantic from Africa to Brazil. The decorations were *not* flown during the crossing



The pilot's cabin and dash of the S.55. British instruments, supplied by "Smith's," were used on all the machines.

into view. The squadron, maintaining its formation, flew over Port Natal and landed at 7.30 p.m. (G.M.T.).

Capt. Donadelli's machine, after 24 hours' difficult towing, reached Fernando de Noronha on January 8, and after repairs had been effected it was flown on to Port Natal. Capt. Baistrocchi's machine arrived at Fernando de Noronha on January 9, but was unable to proceed to Port Natal—some reports saying it crashed in taking off, while others state it was badly damaged in the towing: the crew were saved.

On January 11, the eleven seaplanes—five of which had been named after those who had lost their lives in the flight—left Port Natal for Bahia, 600 miles distant, where they arrived after a little more than seven hours' flying.

We have already described the Savoia S.55 machine (a detailed description of the original type was published in our issue of April 9, 1925, and some notes on the present Atlantic model were given in our issue for December 26 last), but the following particulars may be of interest.

The machine is a twin-engined, twin-hulled Savoia Marchetti Atlantic S.55 monoplane flying-boat with the engines mounted in tandem above the wings. Pilot's cock-pit, seating two side by side, is in the centre of the leading edge of the wing. The engines are Fiat A22R 12-cylinder, 500-600 h.p. Dimensions:—

Span, 24 m.; overall length, 16 m.; height, 5 m.; total area, 93 sq. m.

The tare weight of the flying-boat, including all equipment and the wireless cabins, is approximately 5,000 kg., and the fuel carried was 4,060 kg. The total loaded weight was 10,000 kg. The normal speed is approximately 170 km. per hour and the maximum 220 km. per hour; cruising speed between 160 and 180 km. per hour.

PRIVATE FLYING AND CLUB NEWS

CINQUE PORTS Flying Club:—Fog has practically stopped flying on all days during the past week and conditions were only possible for a small part of Tuesday, Wednesday and Thursday. The total flying time was, therefore, only 5 hr. 55 min. One of the club's dual instruction Moths has an interesting history which must constitute something of a record. She was obtained from the Duchess of Bedford on December 16, 1928, after having been with her first owner for eighteen months. During the two years she has been with the club a total of 1,072 flying hours, mostly for dual instruction, have been done in her and in spite of this hard work the club has earned a no-claim bonus on her insurance policy for each year.

The engine (Cirrus II) has, of course, been changed when each periodical overhaul became due, and it says a very great deal both for the aircraft and the engines that the whole of this large amount of flying has been accomplished without any troubles at all. Taken at an average of 75 miles per hour this time represents a distance of 80,000 miles, and those who consider that aircraft are delicate pieces of mechanism would do well to ask themselves whether a £600 motor car would be likely to give no trouble other than periodical inspections if it were driven for 40,000 miles each year for two years in succession.

ANOTHER INDIAN Flying Club.—The Allahabad Flying Club has recently been inaugurated. Sir Malcolm Hailey and the Maharajah of Benares have consented to be Patrons, while Sir Grimwood Mears will be Vice-Patron. Mr. Justice Banerji is the President, Brigadier Orton and Mr. Y. C. Ray, Vice-Presidents, and the joint honorary secretaries will be Lt. C. S. Philpott and Mr. Sailanath Mukerjee.

REPAIR WORK at Hanworth.—Few people realise the extent to which the Central Workshops have grown at Hanworth Park. A visitor to these may now see every form of aircraft work being carried out, not only on the firm's own machines but also overhauls for renewal of C. of A. and similar attention being undertaken on privately owned aircraft. The main erecting shop is large and holds a very considerable number of aircraft, and jigs have been erected enabling such repairs as the complete rebuilding of fuselages of all the well-known types to be undertaken. In the Engine Department everything has been laid out for the correct maintenance and repair of engines, while for testing after overhaul a Heenan & Froude dynamometer has been installed in a separate shed. This has proved a good investment, for not only does its use ensure that the engines belonging to N.F.S. which have been overhauled are in perfect order for further service, but also several outside firms have realised the importance of testing their engines properly and are bringing them to Hanworth for this purpose. Major Williams, who is in charge of this department, is to be congratulated on the careful and practical way which he has organised this most important side for his company.

CLEAN LINES: A front view of Mr. Van Tyen's Pander (Gipsy I) showing lines very reminiscent of the Fokker Fighters.

AIRISMS FROM THE FOUR WINDS

R.A.F. Cairo-Cape Flight

THE three Vickers "Victoria" troop-carriers of No. 216 (Bomber) Squadron, under the command of Squadron Leader H. W. G. J. Penderel, and carrying Group Captain E. M. Murray (representing the A.O.C. Middle East), left Heliopolis on January 12, on their flight to the Cape and back, and arrived at Wady Halfa that afternoon, having landed *en route* at Assouan. Proceeding next day they flew to Khartoum, making a halt at Atbara. During the flight, troop-carrying exercises will be carried out at various halts in the heart of Africa—the first occasion in which native African troops have been transported by air. The machines are due at Cape Town on February 7, and are scheduled to be back in Cairo by the middle of March.

High Commissioner for Egypt also Flies

SIR PERCY LORAINE, the High Commissioner, left Heliopolis on January 12, in a Fairey III.F. of No. 45 (Bomber) Squadron, piloted by Flight-Lieutenant H. E. Walker and escorted by three other Faireys. They arrived at Wady Halfa that afternoon and proceeded to Khartoum next day.

Kingsford Smith's Next Flight

WING COMMANDER KINGSFORD SMITH, it is reported, is going to San Francisco in April, to complete plans for a trans-Pacific flight to Japan. He will probably use a new four-engined Fokker machine.

Mr. Guy Menzies Makes Further Plans

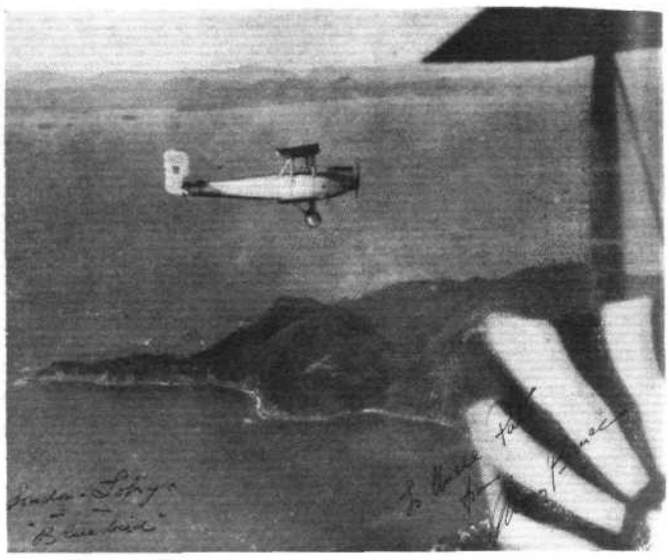
MR. GUY MENZIES—we regret we misspelt his name in our last issue—not content with his flight from Sydney to New Zealand, is planning further ambitious flights in the Avro Avian *Southern Cross Junior* ("Gipsy II"). He proposes to fly round the coast of Australia in under seven days, then to break the speed record from Melbourne to Perth (Western Australia), and, next June, to fly from Australia to Japan.

Miss Amy Johnson

MISS AMY JOHNSON journeyed by train from Warsaw to Moscow on January 10, and was received by Soviet Aviation officials, representatives of the British and Polish Embassies, and the Russian pilot Chukhnovsky. After a conference with Soviet aviation representatives, Miss Johnson definitely announced the postponement of the flight till the summer. The Soviet experts promised all co-operation, the provision of fuel and landing places, motor accessories, and maps of the route. She returned to Warsaw on January 13, and hopes to fly back to London in *Jason III*, which has now been repaired.

A Light Plane Record.

THE French airmen Laloutte and Permoufle left Istres aerodrome in a light aeroplane on January 12 and flew non-stop to Villa Cisneros (W. Africa), a distance of 1,800 miles, in 22 hours. They flew on to Dakar next day and intended to continue their flight to Gao on the Niger.



Mrs. Victor Bruce in Columbia: A snapshot, taken from another machine, of the Hon. Mrs. Victor Bruce flying across Vancouver in her Blackburn "Bluebird."

The Hon. Mrs. Victor Bruce.

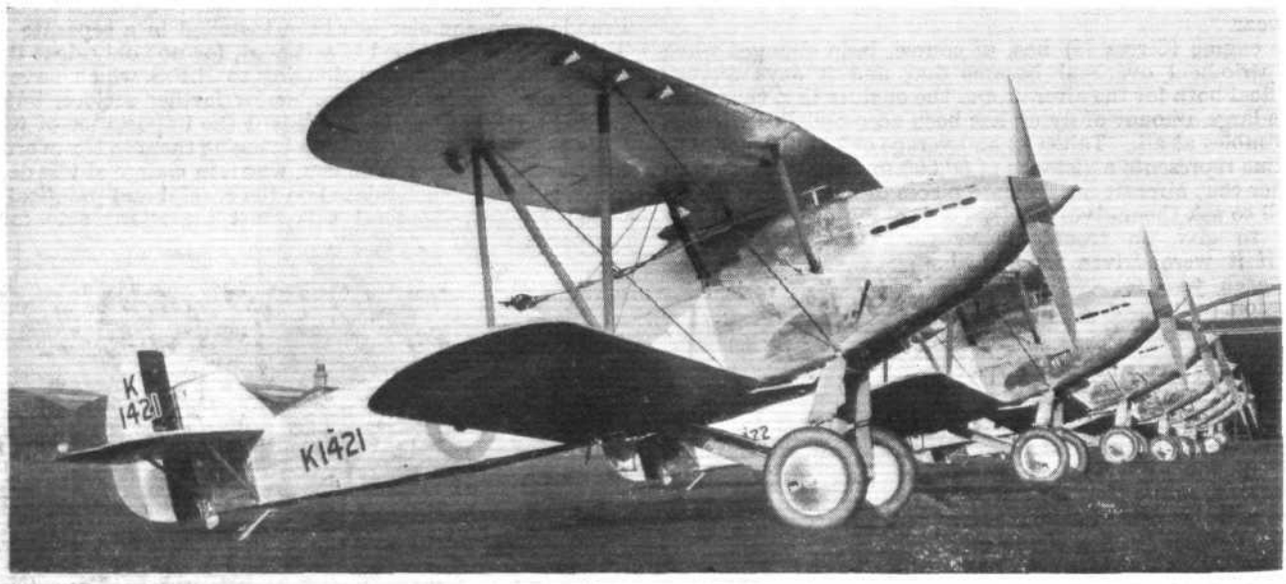
THE Hon. Mrs. Victor Bruce flew from Oregon to San Francisco in her Blackburn "Bluebird" last week and, on January 13, proceeded to Los Angeles. It is reported that she has decided to abandon her projected flight to South America.

Atlantic Flight Fails

MRS. BERYL HART and Lt. W. S. Maclaren, who had to come down at Hampton Roads during an attempt to fly from New York to Paris via Bermuda and the Azores, started on a second attempt on January 7. They left Hampton Roads in their mono-seaplane *Trade Wind* at 6 a.m., and landed at Hamilton Harbour, Bermuda, at 2 p.m. They left for the Azores on January 10, and were due to reach the Azores the following afternoon. No further news of the machine was received, however, and on January 13 the liner *President Garfield* picked up a wireless message from the Azore sstating that it was thought that the *Trade Wind* had fallen into the sea about 20 miles off Sao Miguel Island.

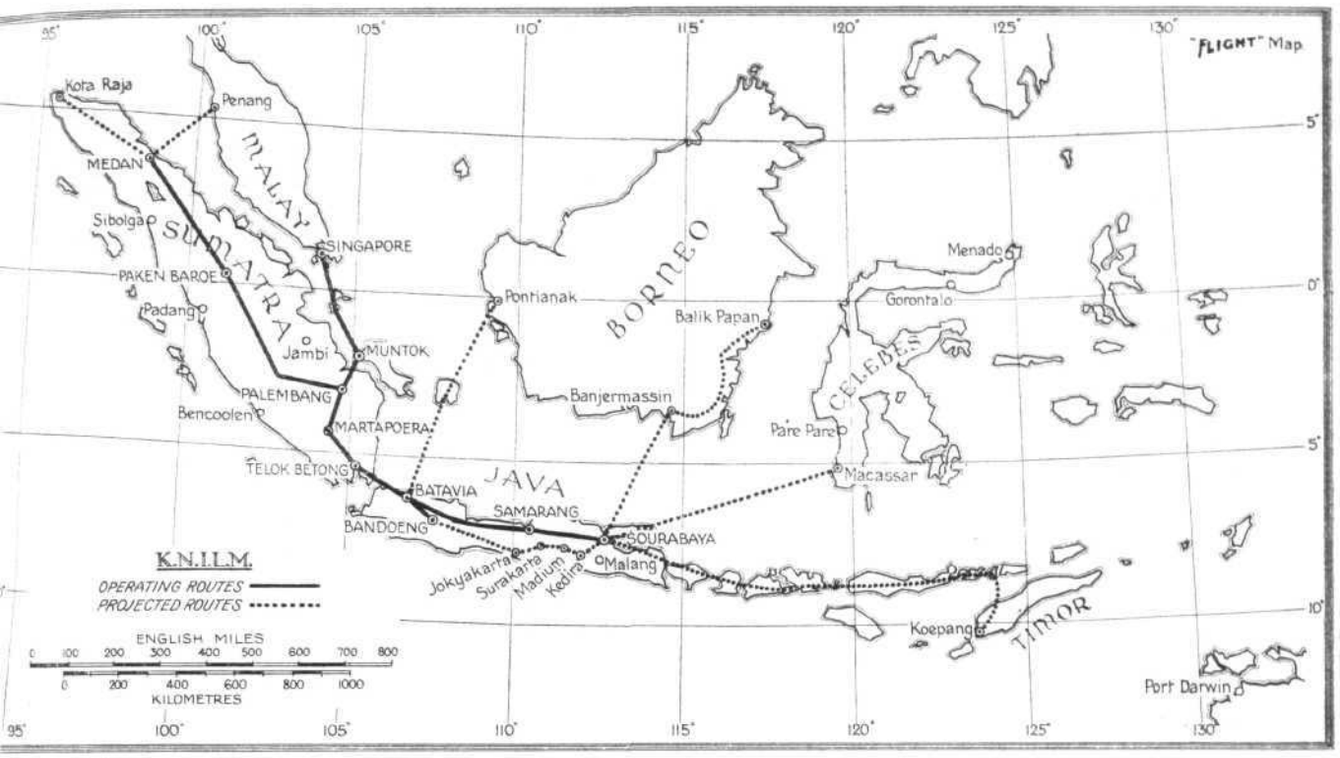
Do.X and the Atlantic Flight

THE commander of the giant German seaplane Do.X states that he intends to start on the projected ocean flight from Lisbon to Rio de Janeiro on January 20.



RE-EQUIPPING THE R.A.F.: Seven Hawker "Harts" with Rolls-Royce engines ready for delivery to No. 12 (Bomber) Squadron, Andover. (FLIGHT *Photo.*)

AIR TRANSPORT



THE ROYAL DUTCH INDIAN AIRWAYS

By M. LANGLEY, A.M.I.Ae.E., A.M.Inst.N.A.

ONE of the world's most important and successful air lines is that operating locally in the Dutch East Indies. Very little is known about it in England, and I, erefore, paid a visit to the head office of the company at Nieuwe Spiegel Straat, Amsterdam, to see if anything uld be learned.

Modesty has possibly prevented the Dutch from telling e world about this line, but Mr. van Rendorp, the managing rector, was most helpful, and gave me some very valuable formation.

The services now extend from Medan, in the North of matra, to Surabaya, at the eastern end of Java, and ver a total distance of about 4,000 miles. In the two years m the opening of the lines on November 1, 1928, to Novem- r 1, 1930, a distance of 825,000 miles has been flown, 33,000 ssengers carried, together with 880,000 lb. of freight and 400 lb. of mail. At the present time an average of 2,000 ssengers a month are using the service—a figure which is out double the usual winter number passing through ydon. The routes operated by K.N.I.L.M. are shown in e map at the top of this page.

Having thus given an idea of the importance of the Royal tch Indian Airways let us trace its history.

A "Commission for Aerial Traffic," which was set up in e Indies in April, 1919, investigated the possibilities and concluded that an early start should be made. A similar conclusion was arrived at in Holland at the same time by a Commission, which considered the place the Mother Country and its colonies should take in the aerial mail services of the world. When the K.L.M. was established in October, 1919, they immediately took steps to secure a government subsidy. Owing, however, to the unsettled financial conditions at the time, the Colonial Minister would not give his sanction to any monetary support. The matter was dropped for four years when the National Council again urged the necessity of establishing a service, but without result. The economic conditions of the Indies were improving, and a lead was being given by the action of other countries in granting assistance to air transport. Nothing came of it for another three years.

In 1927, Big Business took the matter up, and quickly provided the capital for forming the K.N.I.L.M. (Koninklijke Nederlandsch-Indische Luchtvaart Maatschappij) or Royal Dutch Indian Airways. The capital was f.10,000,000 (£834,000), of which f.5,000,000 was paid up. The company was to be separate from the K.L.M., but co-operation was to be established and a line of demarcation drawn. This led to the K.L.M. undertaking to work between Holland and Batavia, whilst the K.N.I.L.M. would operate all the internal services in the Indies. Support was forthcoming on all

EXTREMES IN PASSENGERS: Not only "White" travellers use the K.N.I.L.M. air lines, as shown on the left, but the natives also patronise the big "man birds"; a party of Borneo Dyaks are seen on the right, after having enjoyed a flight in one of the K.N.I.L.M. Fokkers.

The arrival of the first aeroplane at Semarang aerodrome on the occasion of the opening of the regular K.N.I.L.M. daily Air Service.

sides, from the Governor General and the Military and Naval Authorities, and a subsidy was granted.

The company was actually established in July, 1928, and the services began on November 1, 1928. Seven three-engined Fokker VII b machines form the equipment. These are eight-seaters, and have an operating speed of 100 m.p.h. Five are fitted with Armstrong Siddeley "Lynx" engines of 220 h.p., and two have "Titans" of 230 h.p.

Two Fokker F XII are on order and will shortly be put into the services. These are 14-16 seaters with 3 Pratt & Whitney "Wasp" engines of 425 h.p. each.

The services operated are as follows :—

1. *Batavia–Bandoeng.*—The distance is 69 miles which is flown twice daily each way in 45 minutes, saving 3¾ hours over surface transport. The fare is £1 9*s*.

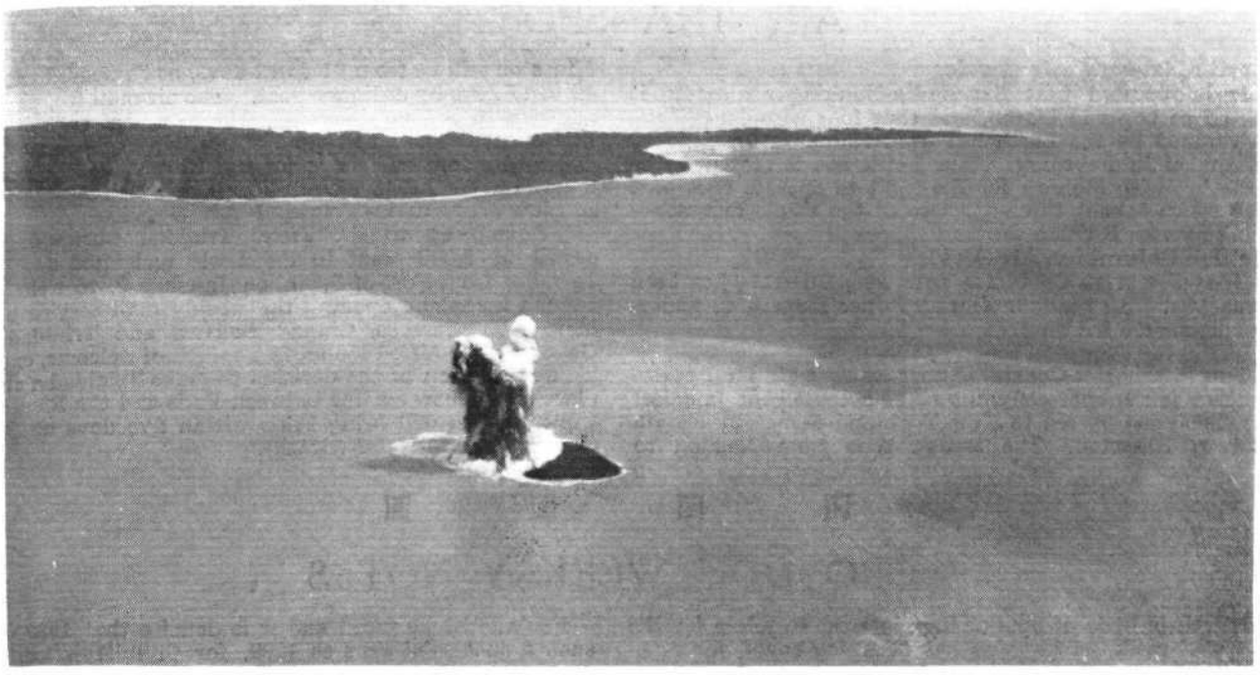
2. *Batavia–Samarang–Sourabaya.*—The distance is 420 miles. The route is covered once daily in each direction. 4½ hours are taken by air, a saving of 9 hours over surface transport. The fare is £5 7*s*. 6*d*. to Semarang and £8 1*s*. 3*d*. to Surabaya.

3. *Batavia–Palembang.*—350 miles. This is a weekly service in each direction. The flying time is 3 hours, which is 30 hours less than the time of surface transport. The fare is £7 15*s*.

4. *Batavia–Palembang–Singapore.*—695 miles. This service is also weekly in each direction and in effect gives a bi-weekly service to Palembang, since it is alternate with No. 3. The flying time of 7 hours is 41 hours saving over surface transport. The fare is £15 6*s*. The route is the only international one of the K.N.I.L.M. and provides communication with China, Japan and India.

5. *Batavia–Palembang–Pakenbaroe–Medan.*—970 miles. This route is worked weekly each way, and supplements services 3 and 4 as far as Palembang. The flying time is

An aerial view of the famous Native Market at Batavia.



An uncommon object on the route of one of the K.N.I.L.M. air services—the volcano island of Krakatau.

hours, and saves 66 hours over surface transport. The
'e is £21. Mail to the extent of 200 lb. is usually carried
connection with the steamer service to Holland. Medan
the principal town of Sumatra's East Coast and is the
ıtre of rubber and tobacco production.
In addition to these routes, the K.N.I.L.M. also undertakes
otographic surveys, crop dusting, and taxi work.
Extensions are intended to Sabang, the first port of call
the mail steamers and in the opposite direction to Koupang
the island of Timor. Although it is not the intention of
: Royal Dutch Indian Airways to extend outside their own
ritory, this last line to Timor might possibly be connected
to Port Darwin if it were suggested by Australia.
The K.N.I.L.M. has created a very noteworthy record.
ıt one of the 33,000 passengers has been injured and only
o flights were not completed.
The following facts may be useful to complete the back-
ound. The Dutch East Indies cover 736,400 sq. miles, and out of a total population of 51,014,000, nearly a quarter of a million are European.

Weather conditions are ideal. Storms are seldom experienced and rain only occurs in such patches that it can be flown round. Mist and fog are practically unknown. The average temperature is 78° F. on the ground and 60° F. at 4,500 ft. altitude. For these reasons wireless equipment has never been found necessary on the machines of the K.N.I.L.M.

When eventually the Imperial route to Australia is opened, the work already done by K.N.I.L.M. over this section of it will be invaluable. Mr. van Rendorp assured me, with true Dutch hospitality, that any British pilots following this route would always have every assistance from the aerodrome staffs in the Dutch East Indies. He anticipated that help would always be given by the Dutch Naval and Military Authorities, and hoped that his company would be able to co-operate happily with our own Imperial service.

The strange Pile Houses of Palembang, as seen from one of the K.N.I.L.M. air liners.

AIR TRANSPORTISMS

A Berlin-Nanking Air Service

IT is reported that the Berlin-Nanking air service is expected to begin in March, and that four aeroplanes have been shipped by the Lufthansa from Hamburg for delivery in Shanghai in February. The Lufthansa is stated to be negotiating with Moscow for the right to operate that part of the route—about three-quarters of the whole distance—which traverses Russian territory.

A British Columbian Air Service

NORTH BRITISH COLUMBIA AIRWAYS, LIMITED, has been incorporated with headquarters at Prince Rupert, to undertake commercial aviation.

Air Mails for Jamaica

THE Postmaster-General announces that air mail correspondence (except parcels) can now be accepted for Jamaica, for transmission by sea to New York and thence by air via Miami to Kingston. The transit time from London to Kingston will be from 11 to 12 days, as compared with from 12 to 17 days by ordinary post. The air mail fee, payable in addition to ordinary postage, will be at the rate of 1s. per half ounce. The latest time of posting at the General Post Office, London, will be as for the United States—normally, 2 a.m. on Wednesdays and Saturdays.

A New Venezuela-Trinidad Air Service

ACCORDING to the *Times* Trinidad Correspondent, a crowd of 5,000 went to the newly reclaimed swamp land 14 miles from Port-of-Spain, on January 9, to welcome the French aeroplane opening the weekly mail service between Maracaibo, Caracas, Ciudad Bolivar, and Trinidad. The Governor, Sir Alfred Hollis, in a speech of welcome, expressed his appreciation of the decision to make Trinidad a stopping place on the new air line between Paris and the French West Indies, which will bring Paris within five days of Trinidad *via* Senegal and Natal (Brazil).

CROYDON WEEKLY NOTES

THERE is little of outstanding interest to relate for the past week, as Croydon has been fog-bound for practically the whole week and in consequence the services have been greatly interfered with, especially as regards incoming traffic. It has been possible on most days to get away from Croydon, provided pilots were leaving for another terminal aerodrome where better weather conditions prevailed. After passing the continental coasts the weather has improved tremendously, but getting into Croydon has been a very different proposition. There have, however, been some very stout efforts made by pilots of all the operating companies, and on various days some really marvellous flying has taken place. It is interesting to watch the passengers alighting after the experience of fog flying, and it is truly gratifying to see how calm they are.

These days mean much hard work for the officer on duty in the control tower, who is assisted by an excellent staff of wireless operators, and a great deal of responsibility of getting the various aircraft safely into the air port of London rests on their skill. Nobody on the aerodrome is more thankful than they when all aircraft have landed safely. One thing which has greatly helped them is the innovation of aircraft working on fixed aerials for short distance work. I am inclined to think that fixed aerials should be made compulsory for all aircraft attempting to approach a busy terminal airport in really sticky weather conditions.

Crystal Palace would appear to have lost its laurels for the finest pyrotechnic displays. You need only visit Croydon on a foggy day and you will see all the fireworks you need. Pilots report very favourably on the type of pyrotechnic now in use. It consists of a magnesium flame fired from an impulse tube to a height of approximately 1,000 ft., and is more effective in fog than anything that has been used previously. One really wonders what induced the Air Ministry to make the choice of Croydon for the Air Port of London, as it is invariably fog-bound.

Penshurst and Lympne came in for a full share of landings during this period, but while this is all very well from a safety first point of view, it is most irritating and inconvenient for passengers to be dumped miles out of the terminal aerodrome, where they have to wait about in the cold, perhaps several hours. It is rumoured that a certain gentleman at Lympne has this time been really overworked. That tremendous overcoat and those decrepit gauntlets must have worked overtime for the first time since they were aboard ship with Nelson ! !

Facts must be faced and it is definite that 1930 was not such a successful year as 1929, for Civil Aviation. Trade depression may be the primary cause but I doubt very much if that is the greatest cause.

Part of the aerodrome puts one in mind of the Strand and various other places during the road repairing season. The unfortunate people in the offices facing the arrival and departure area are being driven to distraction by pneumatic picks, tractors, and motor rollers all day long. This is all in consequence of the aerodrome improvements scheme, but alas ! it does not tend to improve the peace of mind or temper of those who occupy those front offices such as the A. I. D. and the Meteorological Office staff plus the Customs Offices and the aerodrome cat.

An amusing incident occurred during the week, when Mr. Perry of Imperial Airways landed on the West side of the aerodrome in fairly thick fog. The ground staff, having eventually located him near the fence tried to direct him to the Customs Area. After taking advice from a few of them he emerged from the fog and brought his Argosy to the tarmac twenty minutes afterwards !

A most regrettable accident occurred to the Sabena Brussels-London night air mail on Friday last, the pilot G. Dery and his mechanic both being killed. As the accident did not occur in England, full details are difficult to obtain but it appears that an unexpected snowstorm was responsible and one can only assume that the pilot attempted to return to Brussels and hit the ground on a turn. Whatever the cause may be it is most unfortunate, as Dery was a very promising young pilot, and it is a bad start for this new year of 1931. We have yet to educate the public that regrettable as an air crash is, there are far worse accidents on the road. The public still look upon an air crash as something much more terrible than other accidents, and the publicity given to them by the press does not help to educate people in the right direction.

News has just arrived concerning our old friend Capt. Muir. This gentleman left Croydon for sunny Nice on a Puss-Moth at the end of December and he has been sighted there "a taking of his ale," complete with a yellow beret ! Can you laugh that off ? "

The traffic figures for the past week were :—

Passengers 300. Freight 26 tons.

Within a few weeks now we shall see the commencement of the summer services, let us hope that 1931 will beat all previous traffic records.

P. B.

Capt. Macmillan's New Post

HIS many friends at home and abroad will learn with interest that Capt. Norman Macmillan, M.C., A.F.C., has been appointed one of the principal foreign sales representatives of the Armstrong-Siddeley Development Co., Ltd., of Coventry. As is now well known, the Armstrong-Siddeley Development Co. controls the firms of Sir W. G. Armstrong-Whitworth Aircraft, Ltd., Armstrong-Siddeley Motors, Ltd., and A. V. Roe and Co., Ltd., and so Capt. Macmillan will be the representative of a very powerful group of companies. As a pilot of very many years' experience, and as a test pilot of nearly as many, Capt. Macmillan knows all there is to be known about aviation material in general, and doubtless he will not be long with his new firm before learning all about their particular aircraft and engines, so that his persuasive powers should soon become the particular brand which springs only from the fount of deep personal conviction. We gather that Capt. Macmillan will also act as consultant test pilot to the companies of the Siddeley group. In his new post Capt. Macmillan will necessarily travel a good deal on the Continent, where his reserve and personal modesty will, we have no doubt, soon make for him many good friends. In the meantime, all his old friends at home will join us in wishing " Mac " every possible success in his new post.

An Aerial View of the Hull Municipal Aerodrome at Hedon. (FLIGHT *Photo.*)

MUNICIPALLY-OWNED AERODROMES

DURING the past year a great deal of pressure has been brought to bear upon large numbers of municipal authorities in an attempt to induce them to undertake the establishment of aerodromes in the vicinity of their various cities and towns.

According to the latest Air Ministry report, there are already eight who have established aerodromes, four who are actively engaged in doing so, and about 80 more who are thinking about it. This is a good sign for the future of aviation in this country, and the spirit which has induced them to do so much must be engendered at all costs. If air transport is to become a business of any size at all, either in the near or distant future, then it is essential that every town of any import must have its aerodrome and that interspersed between these towns there shall be plenty of landing grounds which may be used in case of emergencies, although they are not necessarily maintained as terminal aerodromes. It must be obvious to everyone who thinks at all on this matter that a lack of aerodromes is bound to retard the development of flying, whether it be for air-taxi work or for private flying. Motoring would never have reached the proportions it has done so rapidly had it been impossible to obtain petrol and oil at garages situated within every few miles of each other. In Germany the average distance between petrol pumps must be less than half that which it is in this country, and one has to travel over there to realise how convenient this is even in these days, when the ordinary car has enough petrol capacity to enable it to travel some 150 miles without refuelling.

So it is with aircraft, but much more so, not however, only on account of fuel, since an aircraft cannot comfortably land for any purpose whatsoever except on a suitable landing ground.

I believe that many of the towns which have been approached have been known to say that there was not a sufficient volume of air traffic to warrant their laying out money on an aerodrome, nor was there evidence that this volume would be forthcoming as a result of their doing so. Now this sort of view shows shortsightedness and a lack of appreciation of the facts which can be learnt from any other means of transport. When the, now common, long-distance motor coaches started their journeys there were no queues of people clamouring for transport by road, but as soon as the services were started and run regularly, so that people were certain of getting a coach when they wanted it, the demand came just as it will come, as soon as it is possible to rely on there being an air taxi available whenever it is wanted. Of course, the weather is probably always going to be a serious deterrent to those who wish to rely on travel by air, at least for many months out of each year in this country, but as soon as there are aerodromes close to most towns it will generally be found possible to get close enough to the desired destination to save time on the surface means of transport, except where both the destinations lie on a main line route, though even then if the aerodromes have been chosen with care and sense, so that they are not far from their towns, a considerable saving in time should still be possible with the better types of modern aircraft.

There has, as I said at the beginning, been a great deal of propaganda served out to the municipalities with the intention of getting them started on their aerodrome schemes and a lot of it has been sound common sense, but a lot has also, I feel, been far too optimistic. Some municipalities must have been led into it, with the idea that it was a money-making scheme of the type which would bring them a large return in a very short time, and have naturally been disappointed. Now, that is just the sort of thing which must be avoided at all costs, for, above all, we do not want any town authorities to put a lot of their ratepayers' money into an aerodrome, and then turn round and tell everyone that "there is nothing in this aviation business," simply because they are not getting the returns they have falsely been led to expect. I do not want to be misunderstood, however, nor do I want it thought that I am not heartily in agreement with a policy which advocates the establishment of aerodromes wherever these are possible, for I am; but I do want to advocate a sane and sensible manner for putting the whole proposition before these authorities.

From what I have seen done at some places I can only assume that the authorities concerned have, very naturally, been keen to use their own resources, and their own staff, and that they have been given little or no help from those actually in aviation as to the best way to tackle the numerous problems presented. I refer most particularly to the apportioning of the money voted for the scheme in each case. There are instances where very large aerodromes indeed have been or are being prepared near provincial towns, although the chances of all that area being required for many years are extremely remote. Preparing an aerodrome surface means that it must subsequently be kept in good order if a very large percentage of the money put into it is not to be lost through deterioration, and this, of course, adds largely to the upkeep cost of the whole. Surely in cases like these, it would be far better to purchase the land, and make quite certain that it is available for preparation when required, but in the meantime only to prepare an area which is commensurate with the actual requirements.

The argument which will at once be put forward is that I do not understand Town Councils, otherwise I would know that unless those responsible got and spent the money voted while those said councils were in their first flush of enthusiasm, it would be impossible to get sufficient afterwards. I may not have had great experience of those much-maligned bodies, it is true, but I cannot help thinking the insinuation that they are so foolish as to be above receiving advice about the best way to lay out their capital on such specialised jobs is an unjust aspersion on most of them. It may have been merited some years ago, but more recently many Councils have shown themselves thoroughly alive to the necessity for doing everything in their power to further the trade and subsequent prosperity of their respective cities and towns.

It seems to me that insufficient attention has been paid to the value of a municipally owned aerodrome as a means of, to use a much hackneyed phrase, "making the public more air-minded." In those which have at present been established much has been done, in some cases at any rate, to provide for visiting and local aircraft, their pilots and passengers, but little or nothing seems to have been done which would attract the local populace, and, as is even more important in many places, seasonal visitors.

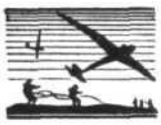
We hear of very large sums being spent on such things as ponds for children to sail their boats in, and many other schemes designed to add to the attractions of the place,

and thereby induce more visitors to come and spend their money in that town, but so far, no one appears to have been far-sighted enough to realise the vast potentialities there are in a properly operated aerodrome as means of permanent attraction to both visitors and inhabitants alike. Our ethnologically minded writers may not agree when I draw a parallel between the average inhabitant of this country and that of, say, Berlin, but there is every evidence that their respective tastes in amusement do very nearly coincide. Take, then, Berlin as an example; at the Templehof aerodrome large crowds are to be seen every Saturday and Sunday, and, in fact, in comparatively large numbers any weekday. A very large proportion of the money spent there has been spent with the object of attracting those crowds, and it has succeeded. The restaurant is well patronised, and while I will not allow that it cannot greatly be improved upon, it does at least show one way in which municipalities would be well advised to spend some of the money they would save through not preparing the whole of the ground acquired at the present time. There is really no end to the suggestions which could be put forward with such an end in view. At what aerodrome do you find any attempt made to provide such attractions as, say, tennis courts, putting greens, bowling greens? Given a site near enough to the town with a regular 'bus and train service to and from it, I would even go so far as to advocate the erection of a cinema theatre to be run in conjunction with the restaurant. No doubt many will say, "what a mad idea," but it would certainly bring people to the aerodrome, even if it had to be closed during the winter months.

Any form of attraction which will have this effect must eventually achieve the purpose which we are aiming at, and that is that people should become so accustomed to the proximity of aircraft that they will treat them as they do trains and yachts and thus take them for granted. To make such an aerodrome, as I have in mind, a paying concern, and one which will at the same time serve to increase this "air-mindedness," and form an added attraction to the towns' visitors, does not mean an aerodrome at which flying is looked upon as the one and only means of entertainment for those who go there. Flying displays must certainly be organised at intervals but the main essential is that there should always be something doing when the weather is fine; that "something" need not be a carefully arranged and advertised display, for the mere sight of an aircraft in the air still makes most people look at it and even the ordinary joy-riding machine going about its lawful occasions still has the effect of bringing many people to see what is going on.

Much remains to be said on the subject of aerodrome operation, and the problem is different for every location, but space debars me from going into further details at the present time; these few words will, however, I hope, serve to show that while it is essential for us to see a great increase in the number of aerodromes established during the present year, it is equally essential that blind enthusiasm is tempered by clear-sighted keenness. There are already signs that certain municipalities are taking up their aerodrome schemes on these lines, so let us hope that many more will shortly be following their example.

"DAEDALUS."



GLIDING

AUTO-TOWING.—Mr. C. H. Lowe-Wylde of the British Aircraft Co., Maidstone, has recently made an attempt to provide a machine particularly suitable for towing behind a motor car, since there appears to be a growing desire for this type of gliding in the Midlands where there are few slopes suitable for training. It has been found that the ordinary type of machine was not suitable for this purpose and with the new type Mr. Lowe-Wylde has reached an altitude of 350 ft. above the surface of Hawkinge aerodrome where the test flights have been made. His report states that:—"For these flights the aircraft was coupled to a car, in this case a 4½ litre Bentley by a light steel cable approximately 200 yards long. The flight was commenced from one corner of the aerodrome and after a run of about 80 yards the machine and glider left the ground and climbed very rapidly to the maximum height allowed by the cable.

At this point, the car had very nearly reached the limit of the run that the area permitted, therefore, the pilot operated a quick release mechanism fitted to the nose of the machine which freed the towing cable, and carried on for some little distance before commencing a left-hand turn. Travelling now down wind, ground was covered at a very high speed, and the opposite side of the aerodrome was soon reached, when another turn was commenced, the machine passing about 100 ft. above a farm house. This completed a circuit of the aerodrome, and a landing was made practically in the same place from which the machine had originally taken off. A light type altimeter was carried and the height reached was 350 ft.

Other flights were made to demonstrate the possibilities of this new method of gliding, and Mr. S. B. Green, a director of the company, received his first lesson.

"Auto-towing" as it is termed in America, is an easier and safer way of giving instruction than the popular method of catapulting the machine off by means of an elastic rope, as the car speed can be kept so low that while it is impossible for the machine to leave the ground, the pupil can thoroughly learn the use of all controls with very little risk.

Owing to the rarity of good gliding sites in America, this method has been largely developed there, and with a suitably designed machine and a car carrying a winch from which cable is unwound as the machine climbs, altitudes of from 1,500 to 2,000 ft. have been reached when upon approaching the underside of the cloud strata, the pilot releases himself and commences free soaring in the upward air currents prevailing through clouds, and thus cover great distances.

Carried on, on careful lines, this new phase should do much to strengthen the gliding movement in this country, as in the flat districts, it allows more ambitious work to be undertaken, resulting in greater piloting abilities of pupils.

We must, however, impress upon everybody that this method must of necessity introduce an added element of danger to gliding and should only be undertaken under the most careful supervision and operated by people who have had previous experience and know exactly what they are doing.

On Saturday, January 10, Mr. Lowe-Wylde took his special machine to Hanworth Park and demonstrated it before members of the new gliding section which has been formed there. He was very successful in rising to over 350 ft., after which he cast loose and was able to make a circuit of the aerodrome before finally landing back at the starting point. Both Flt.-Lt. H. M. Schofield and Mr. M. L. Bramson tried the machine and found it simple to fly and an extremely good way of learning to handle a machine in the air. Further demonstrations will be given at Hanworth in the near future, and their gliding section are themselves hoping to start towed gliding on their own. There is no doubt that such means of gliding at aerodromes like Hanworth, that is, particularly those aerodromes near London which are fog-bound for so many week-ends at this time of the year, will undoubtedly fill a long-felt want. So many people come very long distances to fly and then find that fog makes flying with power-driven aircraft out of the question, and in these cases they should be able to gain a vast amount of valuable experience in airmanship, and at the same time get it in an interesting and often humorous way. Incidentally, they are making great efforts at Hanworth to get everybody interested in this particular section and we advise all members to apply to Flt.-Lt. Schofield for further details.

A NEW INTERMEDIATE Type Glider.—The Brant Aircraft Co. Ltd., of Croydon, tried out their new intermediate type glider "The Scud," last Sunday on the London Gliding Club's ground. Both Mr. Marcus Manton and Mr. Latimer Needham flew the machine for several short flights from the level and from half-way up the slope with excellent results. There are naturally a few minor points which will have to be corrected in the controls, but on the whole they were eminently satisfactory. The gliding angle is somewhere about one in fifteen, while the wing loading is 3·1 lb. per square foot, which is 15 per cent. higher than the contemporary German machines. The weight has come out at 103 lb., this being 2 lb. lighter than the estimated weight. This glider is of the fuselage type with a heavy monoplane wing. The fuselage is ply-wood covered and built in diamond form below the wing. It should prove a very good stepping stone from the Zögling stage to the soaring stage for those clubs who already have several "B" licensed pilots.

ON IMPERIAL SERVICE: The Short "Calcutta" is fitted with three Bristol "Jupiter" Engines.
(FLIGHT *Photo.*)

SOME ASPECTS OF THE DESIGN OF SEA-GOING AIRCRAFT

By A. GOUGE, B.Sc., A.F.R.Ae.S., General Manager of Short Brothers

Being a lecture delivered before the Royal Aeronautical Society on January 8, 1931

READERS of FLIGHT will know that we have constantly advocated an extensive and bold flying-boat policy for British aircraft constructors. There is not the slightest doubt that the future of aircraft in the British Empire lies far more with flying-boats than with land aircraft. The British Empire is essentially an Empire which has, for generations, been held together by the seaworthiness of both her ships and her men, and it therefore seems only logical that she should, in the future, be held together by the seaworthiness of her aircraft and her men. It is well known that we have constantly deprecated both the abortive and the successful flights which have been made over wide expanses of water in land aircraft, since such could never be other than spectacular stunts, and since sane and solid development of overseas flights must lie in the development of sea-going aircraft. On Thursday, January 8, Mr. A. Gouge delivered the following exceptionally interesting paper before the Royal Aeronautical Society. The mass of interesting information which Mr. Gouge has placed before everyone, in his paper, will be welcomed. Mr. Gouge has had very many years' experience with Short Bros. of Rochester, who, as everyone knows, have produced some of the most seaworthy and most airworthy, which means most efficient in every direction, flying-boats at present existent, and whose pioneer work on the construction, operation and maintenance of a tank suitable for testing out the characteristics of both seaplane floats and flying-boat hulls must rank amongst the most important work which has been done by any one aircraft firm in this country. So valuable is the information contained in Mr. Gouge's lecture, that below we publish it in full. Col. the Master of Sempill, in the absence of the President, Mr. C. R. Fairey, who was abroad in Belgium in connection with the recent order for Fairey aircraft which has been placed by the Belgian Government, in his opening remarks, reminded the assembly that Monday, January 12, was the 65th anniversary of the Society, during which time it has grown from some 30 members, to over 4,000. He then introduced Mr. Gouge as the Chief Designer of Short Bros., of Rochester, who proceeded then to give the following lecture:—

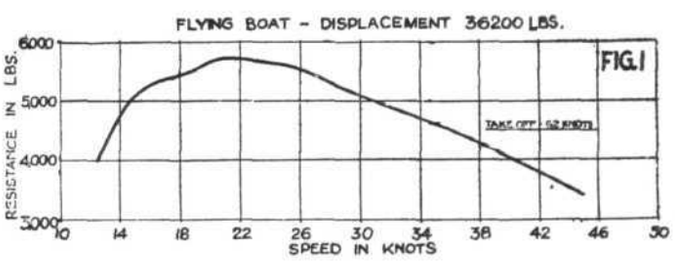
The subject I have to talk about this evening is one on which many previous papers have been read before this Society, so I am afraid I must ask you not to expect much original material from me. Practically the whole of the material I have gathered together is the result of practical experience, and from this point of view I hope it will prove interesting.

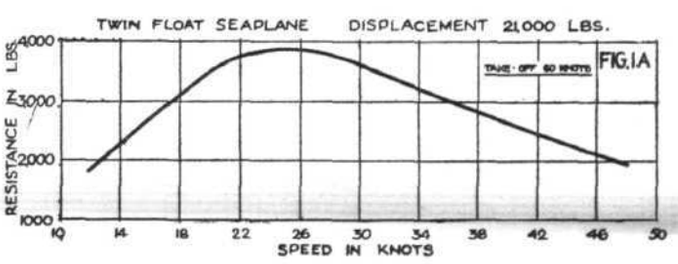
During recent years, considerable development has been done, and good progress made with both the design and operation of big flying-boats. Also, the Schneider Cup races have caused a considerable amount of research work to be done on the development of twin-float seaplanes, particularly with regard to taking off the water at very high speeds, and also to the air resistance of the floats.

In the last year we have seen the advent of the Dornier Do. X, the largest flying-boat yet constructed, whose total flying weight approximates to 50 tons. This, in itself, is an immense step forward, and all credit is due to Dr. Dornier for his courage in conceiving, and his skill in producing, a boat considerably more than twice the weight of any "heavier-than-air" machine previously attempted.

While we have nothing in England which is nearly equal to the Do. X, in weight and size, we have, however, during the last three months, produced a successful boat which has flown at an all-up weight of 40,000 lb. approximately.

Recent years have also seen the successful development of the British flying-boat for passenger and mail-carrying work, and along these lines we may expect, in the near future, very rapid extensions, for it is impossible to link up





the outlying portions of the British Empire without covering in some parts of the journey considerable portions of open sea.

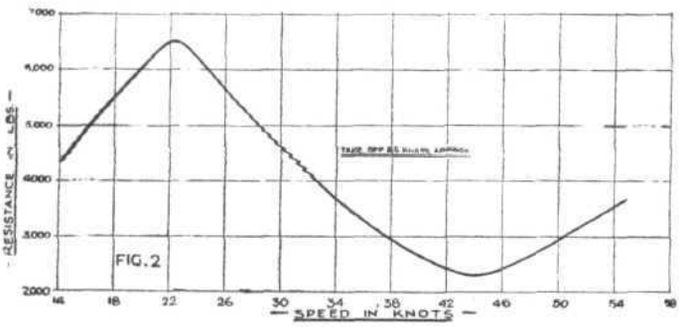
I propose now to describe briefly the method and procedure adopted by my firm when commencing a new design of either a flying-boat or a seaplane.

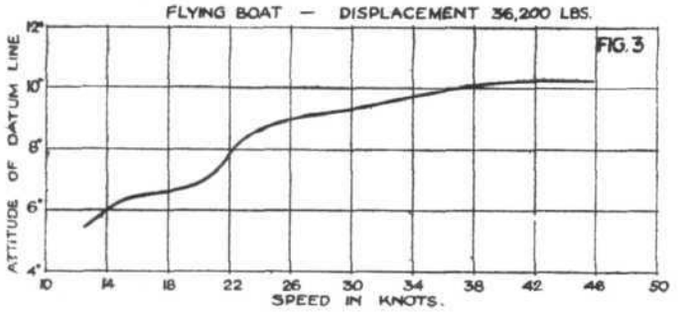
Assuming that all the preliminary details have been settled, the first step is to determine the suitability of the proposed hull or floats for the design under consideration. A model is, therefore, made of a hull or float as accurate as possible to some convenient scale, usually $\frac{1}{8}$th to $\frac{1}{20}$th full size, according to the size of the machine and the range of speeds at which the results are required. These models are usually made of mahogany with a polished finish. By means of weights and a light frame attached to it, the model is balanced about a transverse axis, passing through the point corresponding to the centre of gravity of the full-size aircraft, and is attached to a supporting apparatus on the testing tank carriage.

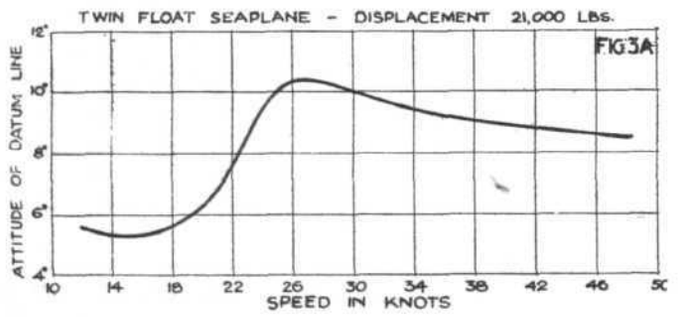
The model is towed by means of a long towing rod which is arranged to be approximately at the same height and inclination as the propeller thrust axis. The other end of this rod is attached to some form of recording apparatus, whereby, when the model is being run, the pull required to overcome the water resistance can be measured.

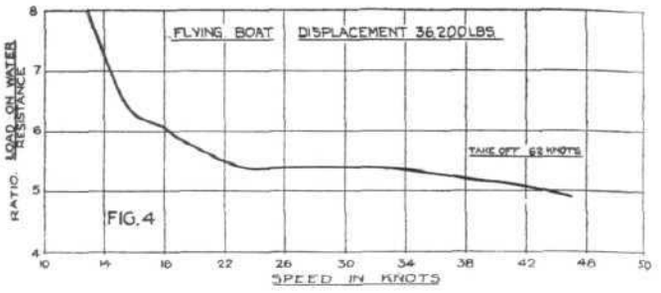
At any particular speed at which it is required to run the model, due allowance is made for the equivalent lift obtained from the planes in full size, this being done by the application of weights supported by light wires over pulleys. It is usual in the preliminary runs to assume this air lift proportional to the square of the speed. If the angle at which the boat runs departs much from the angle of maximum lift, further runs are made correcting for this want of air lift.

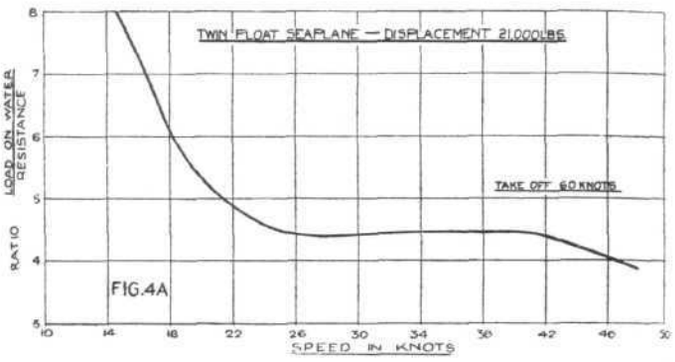
A form of parallel link apparatus attached to the model enables the angle of the model, compared with some fixed datum line, to be measured at any particular speed. The datum line usually used is the forebody keel line just forward of the main step. The water resistance is assumed to be wholly due to wave formation, the results being predicted for full size from the model records, on the basis of Froude's law of similarity. The above is a very brief description of the apparatus used, and the method of carrying out the various tests. Those who require further information on this subject are referred to R. & M. 655.











The two main objects of model tests on a testing tank are (1) to determine the resistance of a float or hull during the take-off run; and (2) to determine the angle at which the float or hull runs relative to the fixed datum line.

The planes on the full-size aircraft are attached at some fixed angle relative to the datum line, and consequently the running angle of the hull or floats has an important bearing upon the lift obtained. Thus, by carrying out tests at the tank, curves showing resistance and running angle at any speed may be plotted. It should be noted here that it is not always possible to set planes on a hull at the best angle for taking off the water, because other considerations may determine that the planes should be set at a finer angle. Thus, if the chief consideration in the design of a boat or seaplane is top speed, the wings will definitely be at a finer angle than if the chief consideration is cruising speed. This is one of the differences between military and civil aircraft. Military aircraft are usually designed on top speed, whereas civil aircraft are invariably designed to be as efficient as possible at a definite cruising speed.

A typical resistance curve of a hull shows that the resistance increases steadily to a maximum value at a speed approximately 30 per cent. of that at which the machine becomes airborne, and as speed increases beyond this, the resistance decreases more or less uniformly. See Figs. 1 and 1A.

Fig. 1 shows the resistance curve of a normal type flying boat at an all-up weight of 36,200 lb. Fig. 1A shows the resistance curve of a twin-float seaplane of an all-up weight of 21,000 lb.

Cases have arisen where a certain increase of resistance occurs at about 60 to 70 per cent. of take-off speed, but this is usually due to some characteristics of the hull lines, and is seldom encountered in present-day design. See Fig. 2.

If it is suspected that on a particular model the resistance will increase at high speeds, then a small model is made so that the resistance at speeds approaching the take-off speed may be investigated.

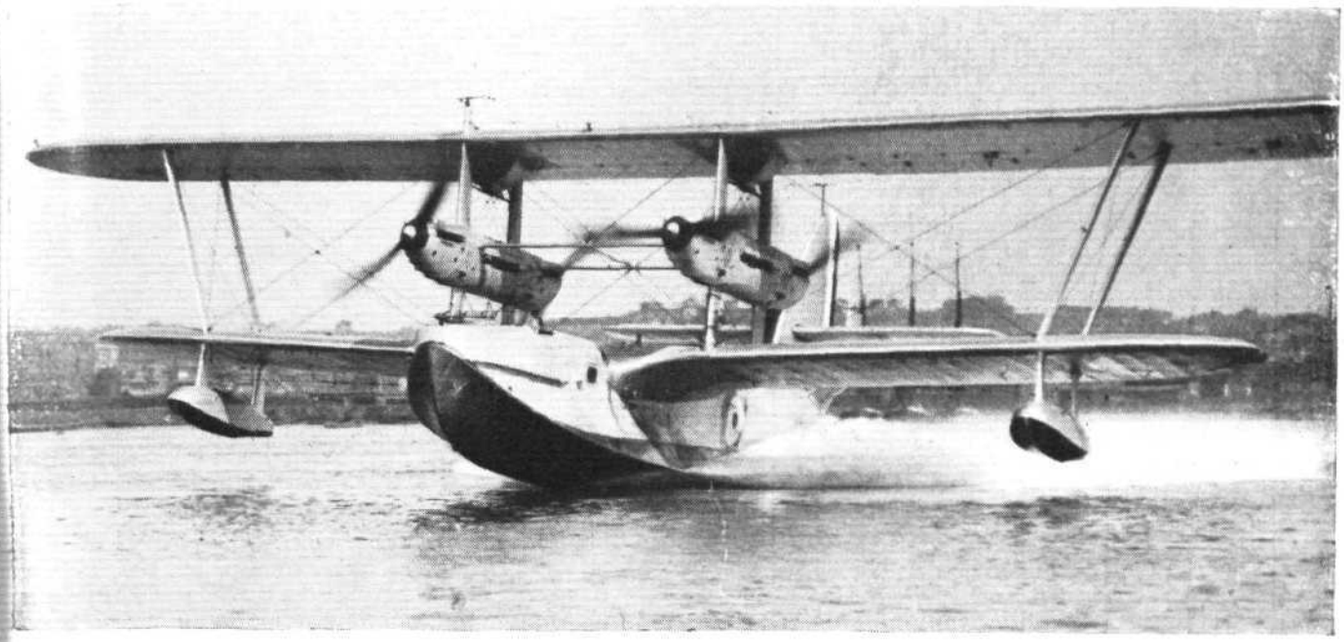
These small models are used as an indication only, and are not relied upon, because the scale is too small for a high degree of accuracy.

The angle taken up by a hull datum line increases gradually as speed increases, although very often a slight decrease is noticed just prior to the machine becoming airborne. See Fig. 3, which shows the angle curve corresponding to the resistance curve shown in Fig. 1.

Floats angle back rather suddenly as the speed at which the hump resistance occurs is reached, and then usually trim forward slowly as speed increases. Efficient floats can be expected to angle forward about $1\frac{1}{2}$ to 2 deg. from the maximum value, by the time take-off speed is obtained. See Fig. 3A, which shows the angle curve corresponding to the resistance curve shown in Fig. 1A.

Load on Water/Resistance

As a means of relative comparison between different types of hulls and floats, a curve showing the value of the ratio load on water/resistance at any speed, is plotted.



IMPROVING THE BREED: The Short "Singapore" Mark II has been cleaned up by placing the four Rolls-Royce "F" engines in tandem, and by abolishing the chine struts. Instead the inner part of the lower wings has been thickened. (FLIGHT *Photo.*)

This value is a form of efficiency ratio, the actual load on water at any speed being the difference between the all-up weight of the aircraft and the lift from the planes obtained at that speed.

Usually, this ratio has a minimum value coinciding with the speed at which the "hump" resistance occurs, and at higher speeds the value increases according to the rate of decrease of resistance.

Efficient present-day hulls have a minimum L/R ratio of 5·0 to 5·4, while for floats a value of 4·0 to 4·5 can be obtained. See Figs. 4 and 4A.

Fig. 4 shows the L/R curve corresponding to the resistance curve given on Fig. 1. Fig. 4A is a similar curve corresponding to the resistance curve given on Fig. 1A.

Cross Curves

For various reasons, it is required to know the characteristics and behaviour of hulls and floats as the take-off speed is approached, when subject to moments applied by loads on the tail plane. Tests can be carried out, whereby at any constant speed the angle and resistance for a corresponding applied moment are recorded.

Usually, as the hull or floats are trimmed forward slightly from the natural running position, a decrease in resistance is obtained, notwithstanding the fact that less lift has thereby been obtained from the planes.

It will be noticed from the curves, however, that if trimmed forward too much, the resistance increases, as is also the case when the machine is trimmed aft. Fig. 5 shows the moment curve at 40 knots for a flying-boat hull at a displacement of 30,000 lb.

Fig. 6 shows a corresponding curve for a twin-float seaplane of 21,000 lb. displacement.

It should be noted here that the moment curves shown do not allow for any moment due to the propeller thrust, and as in both cases the thrust line is slightly above the centre of gravity, the running angle of the full-size machine will be slightly less than the angle indicated on the curves. In both cases the moment did not exceed 15,000 ft.-lbs. There is considerable difference of opinion regarding the ease with which a flying-boat or seaplane should be controllable longitudinally while on the water at speeds approaching the take-off speed. I am of the opinion that all that is required is control sufficient to trim the machine about three degrees. If more than this is allowed there is the possibility, if the forebody has normal V sections, that the hull or floats will become directionally unstable, with the result that the machine will have the tendency to swing quickly to port or starboard.

Tests Applicable to Floats Only

Longitudinal Stability (Static)

With the floats at rest under normal conditions of loading various moments are applied, both fore and aft, and the corresponding attitude taken up is recorded.

By this means a stability curve is obtained showing the moments which will cause the float to become unstable fore and aft, and from this curve the approximate longitudinal metacentric height can be calculated.

Experience with various types of seaplanes which have proved satisfactory, has led to the assumption that if the all-up weight of machine is W lbs., then for a reasonable degree of stability:

Longitudinal G.M. should not be less than

$$1 \cdot 77 \sqrt[3]{W}$$

and the moment to cause instability aft should not be less than

$$(1/10)\ W^{4/3}$$

Fig. 7 shows such a moment curve.

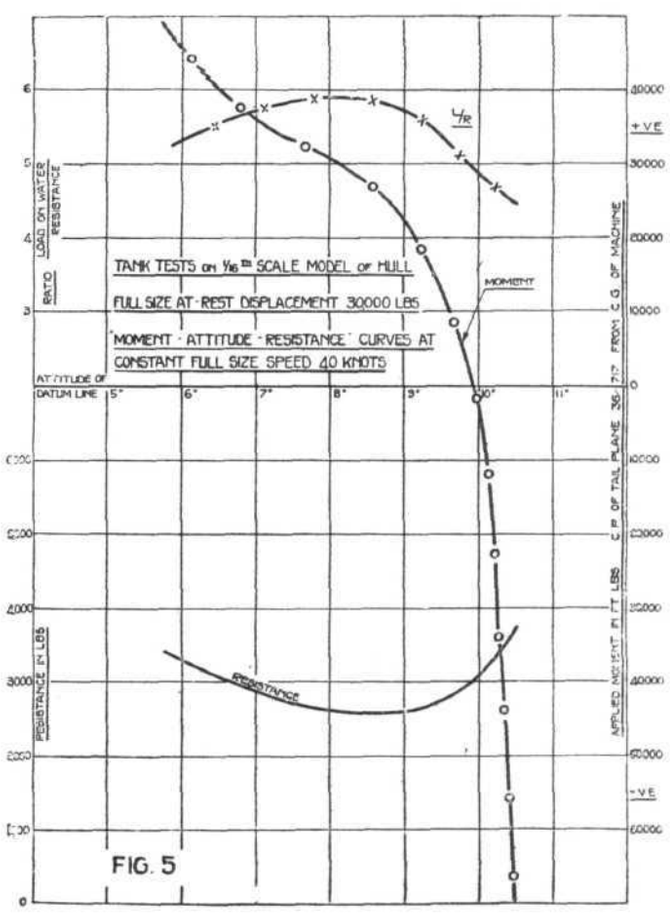
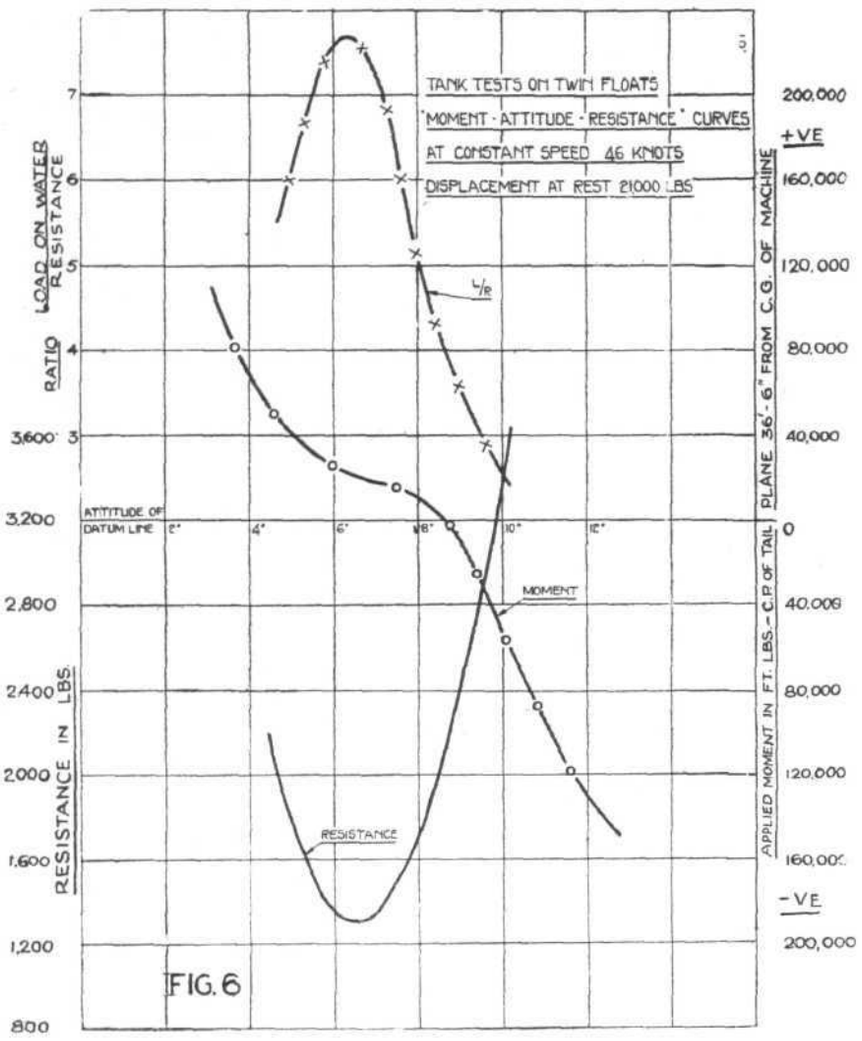


FIG. 5



Transverse Stability of Twin-Float Seaplanes

Tests are not usually carried out at the tank to investigate the transverse stability.

The track of the floats is arrived at for any machine so that the calculated transverse G.M. is not less than $\frac{3}{4}\sqrt{W}$ when W is the all-up weight of the machine, and an additional margin of safety is allowed for in the case of high wing monoplanes.

If twin-floats are to have the necessary degree of stability, together with reasonable seaworthiness, it is essential that they should have a reserve buoyancy of not less than 100 per cent. For all commercial machines this figure should be exceeded.

Single-Float Seaplanes

Single-float seaplanes stabilised with small wing tip floats have not been used to any extent in this country, although they are used in good numbers in the U.S.A. They have definite advantages, in some respects, over the twin-float type, particularly with regard to longitudinal stability and efficiency on the water. Figs. 8 and 9 give a comparison between tank tests of twin and single floats for the same machine, the total weight in each case being 1,650 lb. From these tests it is apparent that the single-float type is 60 lb., less resistance at the hump, and the resistance falls off better after the hump. It is very surprising that so little work has been done on the single-float type in this country.

Before leaving the subject of tests on floats there are two other tests which it is usual to make on any new design of floats. The first of these is to determine the effect of nose diving moments on the running angle of the floats at slow speeds. All floats, so far as my experience goes, are definitely less stable longitudinally when taxying than when they are at rest. Fig. 10 gives the effect of nose diving moments on the running angle of a twin-float seaplane of 21,000 lbs. total weight. From this curve it is seen that a moment of 42,500 ft.-lbs. submerges the floats at just over 20 knots.

Fig. 11 gives a similar curve for a single-float seaplane of 5,500 lb. weight. The other test referred to above is the effect of moments on the floats when the machine is drifting backwards.

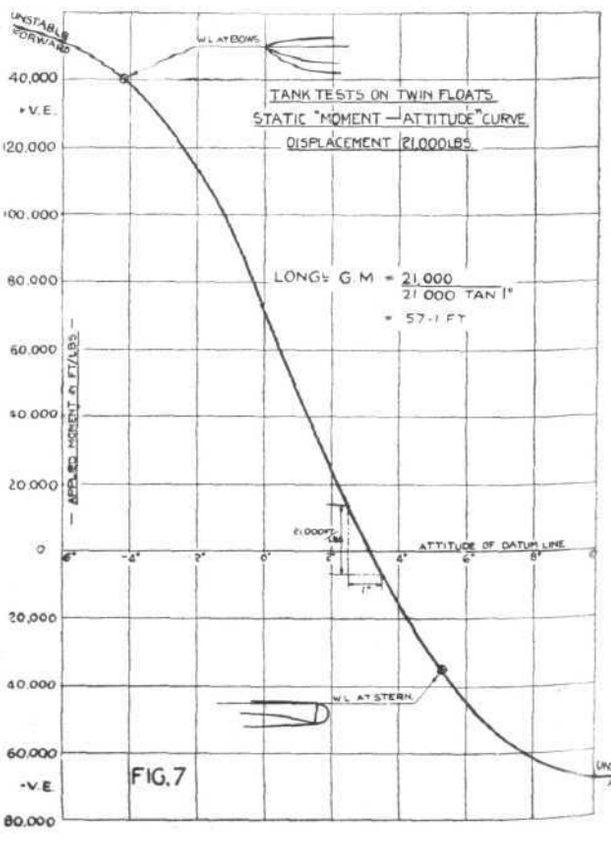
The foregoing is a brief description of the main results obtained from a model test, and the actual results given are for modern boats and floats. The boats are of the two-step type with the main step just aft of a vertical line through the centre of gravity, the exact position being influenced by the height of the centre of gravity above the water line, and the position of the thrust line. The floats are all of the long single-step type, the bows being somewhat similar to the bows of a boat while the aft end runs in a sharp Vee.

In addition to the standard tests previously described, there are several other tests which it is usual to make, such as measurement of the height of the bow wave and its position relative to the propeller disc. This test is particularly important on a hull which may be overloaded by more than 5 or 10 per cent. The position of the tail plane relative to the wave that leaves the end of a float is also important, for cases have arisen where this wave swamps the tail during landing.

The longitudinal stability of the hull or float when running at high speed on the water is also investigated. The period of oscillation of the model does not represent the periods in full size, but it can, I think, be definitely stated that if the model runs stable on the testing tank the full size hull or float will also run stable.

The Tank at Rochester

Before leaving the subject of tank tests it may be of interest to describe some research work which has been undertaken in the past year on Messrs. Short Bros'. testing tank. The object of this research work was to obtain some idea of the distribution of the pressures over the bottom of a hull or float when moving through the water at high speed. Considerable work has been done in various parts of the world on the impact loads during take-off and landing; these impact loads are very important and interesting, but it seems to me that if real progress is to be made the first thing to investigate is the pressures under steady conditions. After a considerable amount of work on a model of a complete hull, the conclusion was arrived at that we were still working on a shape that was too complex for the results to be analysed with any degree of success. (The results of some of this work were published in *Aircraft Engineering* for November 24, 1927).



FLOATS INSTEAD OF HULL: The Short "Valetta" mono-seaplane, Bristol "Jupiter" engines, can also be fitted with land undercarriage. (FLIGHT *Photo.*)

The tests were, therefore, started once more, working this time on a flat plate immersed in the water a constant depth, and running at a constant angle and a constant speed, the intention being to run at various angles and various speeds and finally to divide the plate in two to form various angles of Vee and repeat the test through the various angles and speeds. This is, of course, a very extensive programme, but it is hoped on its completion to know a little more about pressures which occur on the forebody of either a hull or float under steady conditions.

Fig. A shows the pressure measured on a flat plate, 18 in. of its length being immersed at an angle of 10° when run at a constant speed of 15 ft. per second. The results are given in lb. per square inch, and in the form of lines of constant pressure. This simple case gives some idea how complex is the subject of pressures on the bottom of a hull or float.

Wing-Tip Floats

The whole of the tests on hulls, which I have described previously, refer to hulls stabilised laterally with wing-floats. The requisite size or volume of wing-float for any machine to give a reasonable degree of transverse stability has been the subject of much discussion, which I do not propose to continue here.

Fig. 12 gives the values of the displacement of the wing-float, multiplied by its distance from the centre of gravity, plotted against the total weight of the machine for a family of boats, of weights ranging from 1,750 lb. to 70,000 lb.

This family being generally similar, the angle of roll to submerge the floats remains practically constant and equal to 6° to 6½°.

The actual volume of the wing-floats in this family is increasing slightly faster with size than the main hull, though for exactly similar machines the wing-float volume should be directly proportional to the total weight of the machine.

I have drawn attention to this point because it has been stated that, finally, when flying-boats become large enough they will become laterally stable, using the main hull, but this is contrary to my experience.

The Effect of Non-Standard Conditions on Take-off of a Flying-Boat or Seaplane

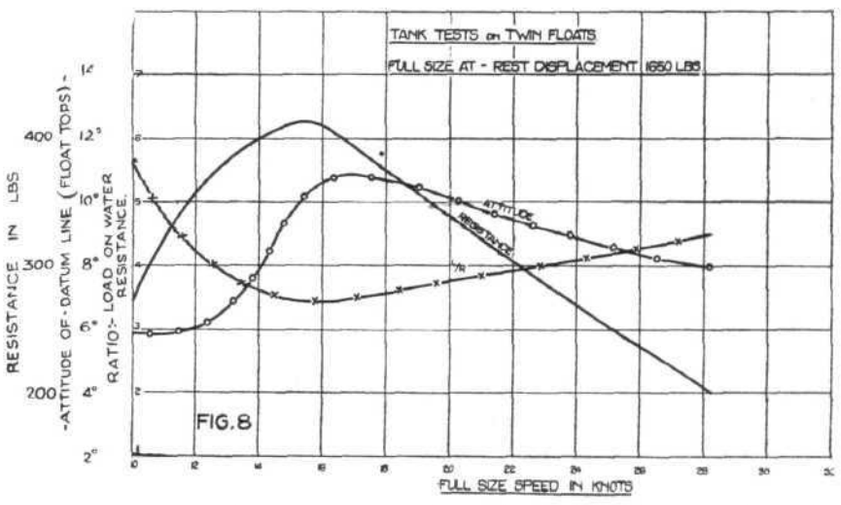
With the rapidly increasing use of flying-boats, to connect up the outlying parts of the Empire, particularly in the tropics, various problems have arisen, and I now wish to draw attention to the serious effect of air density on the take-off qualities of a flying boat or seaplane.

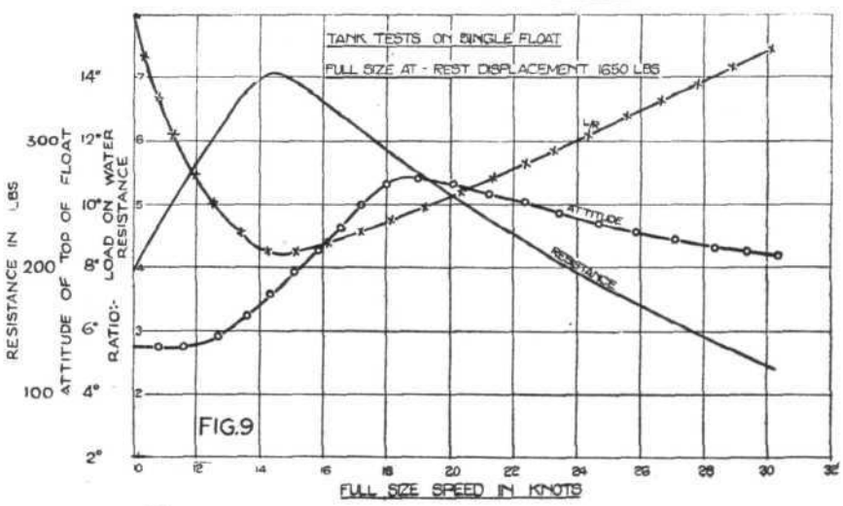
The mathematical investigation of this problem is given in an appendix to this paper, and is an extension of an article published by myself in *Aircraft Engineering*, for November 24, 1927.

Although the underlying assumptions on which this mathematical investigation is based are not altogether exact, they are sufficiently close to the truth to give a very good approximation. The only reason for using these mathematical expressions instead of a step-by-step integration is that the latter method is so tedious that it is almost impossible to draw any general conclusion therefrom.

Calculations have been made relative to a particular machine whose all-up weight, under normal conditions, is 22,500 lb.

The full line in Fig. 13 gives the calculated time to take-off plotted against all-up weight in air of standard density of a





flying-boat of normal British type fitted with naturally aspirated air-cooled engines. From this curve it will be seen that at 22,500 lb. the time to take-off is 26 seconds. This calculated time is very close to the actual time taken by this particular boat, in fact the whole of this curve does not depart from the full size results by three or four per cent.

The dotted line in Fig. 13 gives the calculated time to take-off in air of relative density 0·9, from which it will be noted that the time to take-off at normal load of 22,500 lb. is increased from 26 seconds to 43 seconds, an increase in time to take-off of 65 per cent.

Also, from these curves it will be seen that the boat under standard conditions will take-off with a load of approximately 27,500 lb. in 60 seconds, whereas in air of relative density 0·9, if the take-off time is limited to approximately 60 seconds, the boat will not take-off with a load greater than 24,000 lb., which is a decrease in load of 3,500 lb.

Although the calculations on which these curves are based have been made for a particular case, they approximately apply in general; thus, if a boat takes 50 seconds to get-off under standard conditions in England, it will fail to get-off in about one day in three in the tropics.

Fig. 14 shows the run to take-off in yards plotted against the all-up weight of the machine, these results applying to the same machine, for which the times to take-off are shown in Fig. 13, from which it will be seen that at 22,500 lb. the run to take-off under standard air conditions is approximately 480 yards, while at air of relative density 0·9 the run to take-off is 680 yards.

A relative air density of 0·9 is frequently met with in the tropics. In fact the whole of these calculations are based on air conditions recorded at Alexandria, where conditions are not so bad as they are at Karachi. At the latter place relative air densities of 0·85 have been recorded; thus the curves given in Figs. 13 and 14 may be taken as giving results which may be reasonably expected. The conclusion to be drawn from these calculations is that it is essential that all boats that have to operate under tropical conditions should be fitted with engines which are supercharged equivalent to a height of, at least, 4,000 ft. Successful long-range flying-boats cannot be produced until this condition is fulfilled.

The subject of the increase of structure weight of aircraft with the increase of total all-up weight has received a good deal of attention in the past, and while I do not intend to discuss this problem in general, I would like to draw your attention to the variation in the weight of floats when compared with their displacement. Fig. 15 gives the weights of seventeen floats ranging in displacement from 2,000 to 22,300 lb. These floats will in general be designed with 100 per cent. reserve buoyancy, so they will be suitable for aircraft of weights between 2,000 and 22,300 lb. The whole of the floats are of metal construction, and the chassis supporting points are included in the weights. While the whole family is generally similar they have all been model tested and altered in detail to suit the requirements of the particular machine to which they have been fitted, so I think I may say they are generally representative of any floats between their limiting weights.

If, now, in Fig. 15, we assume the displacement of a float in pounds, to be equal to the total weight of a seaplane, it will be seen at once that for a seaplane weighing 4,000 lb., the total weight of floats will be 400 lb., or 10 per cent., and for a machine weighing 22,000 lb. the weight of floats will be 1,700 lb., or 8 per cent. approximately. From the foregoing it will be seen that there is a distinct saving in the weight of floats as the size of the machine increases, which is rather to be expected as the linear dimensions of similar floats vary as the $\sqrt[3]{}$ displacement and the areas as (displacement)$^{2/3}$. The fact that the relative areas of floats are decreasing with the weight of the seaplane, is also interesting from the air resistance point of view.

(To be concluded.)

REVIEWS

A USEFUL HANDBOOK

Mr. C. A. SIMS, the staff photographer of our contemporary *The Aeroplane* has produced an admirably got up little book illustrating many well-known types of service and commercial aircraft of the present day. There is a Foreword by C. G. Grey, and the Preface to the Royal Air Force section is informatively and authoritatively written by Mrs. C. M. McAlery. Each photograph is accompanied by a page of descriptive text and the illustrations themselves are photogravure reproductions from the original photographs. The book itself should form a useful and ready means of getting to know a little about most of our more common types of aircraft, but like all such catalogues it will date very quickly and really needs to be produced fairly frequently.

"DAEDALUS."

"British Aircraft Illustrated," by C. A. Sims (A. & C. Black Ltd.), obtainable from FLIGHT *Office. Price 4/- post free.*

CAN YOU ANSWER THAT ONE?

IN his new book "Air Questions and Answers," Mr. P. M. Henshaw has followed the scheme of those people who supply books of questions and answers for those who wish to play that parlour game which takes the form of increasing one's general knowledge. His book consists of some 1,257 questions with their answers, and finishes with a glossary of aeronautical words. The indexes, both general and detail, are admirably arranged and the reader should have no great difficulty in finding questions referring to any subject he is interested in. All this seems on the face of it admirable enough, but when one comes to the questions themselves, one cannot help feeling that the answers have been got out too hurriedly and in many cases at the expense of accuracy. There is no doubt that the idea of such a book is extremely good and there is a very great deal in it which is of value both to the man who knows something about aeronautical matters and who wants the book for reference and also to the tyro who is searching after general knowledge. There are, however, many answers which are frankly so inaccurate as to be ludicrous. To quote one question,

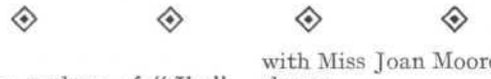
No. 20 "How can drag be decreased?"

By streamlining or so shaping the wings that they offer the least resistance possible. Every shape has a different value of resistance, and this factor is called the co-efficient of resistance and is denoted by the symbol K.

Naturally, anyone who is conversant with the subject can see what the author is driving at, but anyone who is not, cannot learn much from such a statement. The answer to Question 4 is amplified in the answer to Question 5 and mention is made of a constant which is omitted from the formula in the first place. In the answer to Question 199, the propeller boss is quoted as a lightly stressed part and therefore as sometimes being made of elektron! The answer to Question 204 as to what wing loading denotes seems entirely to disregard the weight of the structure itself and merely regards the wings as supporting the load carried by the aircraft. In many places the author uses the word "stress" very loosely, but here no doubt, he has done so with a view to making the language as simple as possible. Unfortunately, however, he has only succeeded in making it misleading. Such inaccuracies one can go on quoting throughout the book, but to do so is merely destructive criticism and I should like to suggest that a second edition of the book be introduced at a later date, for there is no doubt that properly got out it should fill a very definite want.

"DAEDALUS."

"Air Questions and Answers," by P. M. Henshaw (Gale & Polden, Limited), obtainable from FLIGHT *Office. Price 5/- post free.*



An Annual Event

W. B. DICK & Co., the well-known makers of "Ilo" lubricating oils, held their third annual dance on Friday night, January 9, at the Quadrant Restaurant, Regent Street. The committee arranged things in an exceptionally able manner, and the directors, their employees, and guests all thoroughly enjoyed themselves. One of the events of the evening was the exhibition by Mr. Bruce Dick himself, whose superb dancing with Miss Joan Moore put the majority of the younger men to shame.

Memorial to R.101 Designer

AT a public meeting held at Walthamstow on January 6 it was decided that a memorial to Lieutenant-Colonel Vincent Richmond, designer of the airship R 101, in which he perished, is to be raised at Walthamstow, where he lived for many years.

THE ROYAL AIR FORCE

London Gazette, January 6, 1931.

General Duties Branch

The undermentioned are promoted with effect from Jan. 7 :—

Flight-Lieutenants to be Squadron-Leaders :—P. M. McSwiny; R. J. Sanceau; P. H. Mackworth, D.F.C.; G. F. Smylie, D.S.C.; H. L. Macro, D.F.C., A.F.C.; L. M. Iles, A.F.C.

Flying Officer to be Flight-Lieutenant :—A. F. Lingard.

The undermentioned Pilot Officers on probation are confirmed in rank (Dec. 27, 1930) :—D. J. Alvey, W. B. Bailey, J. Bamber, M. G. C. Chadwick, H. F. Chester, A. R. T. Coke, L. E. Dalrymple, E. M. Gurney, L. W. V. Jennens, R. P. J. Leborgne, D. W. Lucke, R. A. McMurtrie, W. C. Pitts, W. T. Ratcliffe, B. P. Reynolds, M. F. Summers, G. R. White, R. B. Whittingham, A. R. Wilson.

The undermentioned are placed on the half-pay, Scale A (Jan. 1) :—Wing Commander Thomas Reginald Cave-Browne-Cave, C.B.E. Squadron-Leader Norman Frank Dennis Buckeridge.

Lieut. Caspar John, R.N., Flying Officer, R.A.F., ceases to be attached to R.A.F. on return to Naval duty (Jan. 2).

The undermentioned are placed on retired list on account of ill-health :—Group Captain Robert John Ferguson Barton, O.B.E. (Jan. 1). Squadron-Leader Gilbert Dirk Nelson, D.S.C., A.F.C. (Jan. 1). Flight-Lieut. Leslie Arthur Cooke Stafford (Jan. 4).

The undermentioned Flying Officers are transferred to the Reserve (Jan. 6) :—*Class A :*—G. M. Beattie, L. S. T. Brown, M. A. Cowan, C. E. Eckersley-Maslin, G. H. Godwin, W. E. W. Grieve, H. T. A. Silcox, C. Warsow, C. D. G. Welch (Lieut., H.A.C., T.A.). *Class C :*—P. A. Moritz.

The undermentiined Flight-Lieutenants relinquish their short-service commns. on completion of service (Jan. 3) :—R. K. Emerson, H. W. A. Fox, E. H. D. Spence, F. W. Wiseman-Clarke.

Flying Officer J. E. A. Binnie relinquishes his short-service commn. on account of ill-health (Jan. 6). Flying Officer T. E. Worsley is cashiered by sentence of General Court Martial (Sept. 24, 1930).

Medical Branch

Flight-Lieut. J. E. Foran, M.B., B.Ch., is transferred to Reserve, Class D.ii (Jan. 4).

Memorandum

Lieut. H. J. H. Dicksee relinquishes his temp. commn. on enlistment in the Territorial Force (Nov. 2, 1920). (Substituted for *Gazette*, April 19, 1921.)

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Flying Officer A. N. Francombe is transferred from Class C to Class A (Nov. 13, 1930). Pilot Officer A. G. Douglas is transferred from Class C to Class AA (ii) (Dec. 19, 1930). Pilot Officer on probation C. F. Morris relinquishes his commn. on account of ill-health (Dec. 4, 1930). Flying Officer J. J. Flynn relinquishes his commn. on account of ill-health (Jan. 7).

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

The undermentioned are appointed to the permanent service (Jan. 1) :—*Sisters :*—Miss Margaret L. Walden, Miss Vera M. Minchin, Miss Nellie Howker. *Staff Nurses :*—Miss Dorothy M. Roberts, Miss Helen D. Terry, Miss Kathleen F. Woodcock, Miss Roberta M. Whyte, Miss Dorothy Mary E. Brand, Miss Norah L. Featherby, Miss Kate Grove, Miss Kathryn D. Johnson, Miss Kathleen A. Witts, Miss Mary R. McC. Dalling, Miss Isabel G. Duguid, Miss Ursula H. Johnson.

AUXILIARY AIR FORCE

General Duties Branch

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON. The undermentioned to be Pilot Officer :—The Hon. E. F. Ward (Nov. 20, 1930).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commander T. B. E. Howe, A.F.C., to Air Ministry (D. of T.), for Air Staff duties; 5.1.31.

Squadron-Leaders : C. E. H. Medhurst, O.B.E., M.C., to R.A.F. Staff College, Andover; 3.1.31. J. Noakes, A.F.C., M.M., to R.A.F. Training Base, Leuchars, 20.12.30. S. P. Simpson, M.C., to No. 4 Sqdn., S. Farnborough; 3.1.31. R. M. Drummond, D.S.O., O.B.E., M.C., to H.Q., Coastal Area; 20.12.30. L. G. S. Payne, M.C., A.F.C., to No. 7 Sqdn., Worthy Down; 1.1.31. W. A. K. Dalzell, to School of Army Co-operation, Old Sarum; 6.1.31.

Flight-Lieutenants : E. L. Bussell, to Air Ministry (D. of T.); 2.1.31. F. G. A. Robinson, to No. 1 (Indian) Group H.Q., Peshawar; 11.12.30. W. A. B. Bowen-Buscarlet, to No. 4 Flying Training School, Abu Sueir; 17.12.30. P. E. Berryman, to No. 5 Sqdn., Quetta; 10.12.30. F. L. Pearce, to R.A.F. Training Base, Leuchars; 6.1.31. M. E. B. P. Storrie, to R.A.F. Depot, Uxbridge; 28.11.30. D. A. Boyle, to No. 601 Sqdn., Hendon; 5.1.31.

Flying Officers : G. K. Horner, to No. 60 Sqdn., Kohat; 9.12.30. J. H. Manning-Fox, to Aircraft Park, Lahore; 5.12.30. C. H. Noble, to Station H.Q., Heliopolis; 15.12.30. R. A. Barnett, to R.A.F. Depot, Uxbridge; 28.11.30. H. G. Wheeler, to School of Photography, S. Farnborough; 6.1.31. B. J. Hurren, to R.A.F. Base, Gosport; 4.1.31.

Pilot Officers : B. H. Jones, to R.A.F. Base, Gosport; 4.1.31. The following are all posted to R.A.F. Depot, Uxbridge, on appointment to short service commissions with effect from 29.12.30 : R. G. C. Arnold, R. J. Bennett, E. R. Berry, H. G. Blair, G. E. O. Browne, W. D. Dennehy, V. P. J. G. Doherty, E. A. Douglas-Jones, J. J. A. Ellison, W. R. Farley, E. D. Green, H. Harkness, G. Hinckley, I. V. Hue-Williams, G. T. Jarman, G. L. C. Jenkins, E. D. Redgment, R. C. Richmond, N. P. Samuels, F. C. Seavill, F. A. A.H. Strath, C. Tapley, F. S. Wakeham, J. M. Warfield, R. G. Whitehead, O. P. E. Williams, J. M. Wilson, R. I. B. Winn.

Medical Branch

Flight-Lieutenant C. A. Lindup, to H.Q., R.A.F. Mediterranean, Malta; 19.12.30.

NAVAL APPOINTMENTS

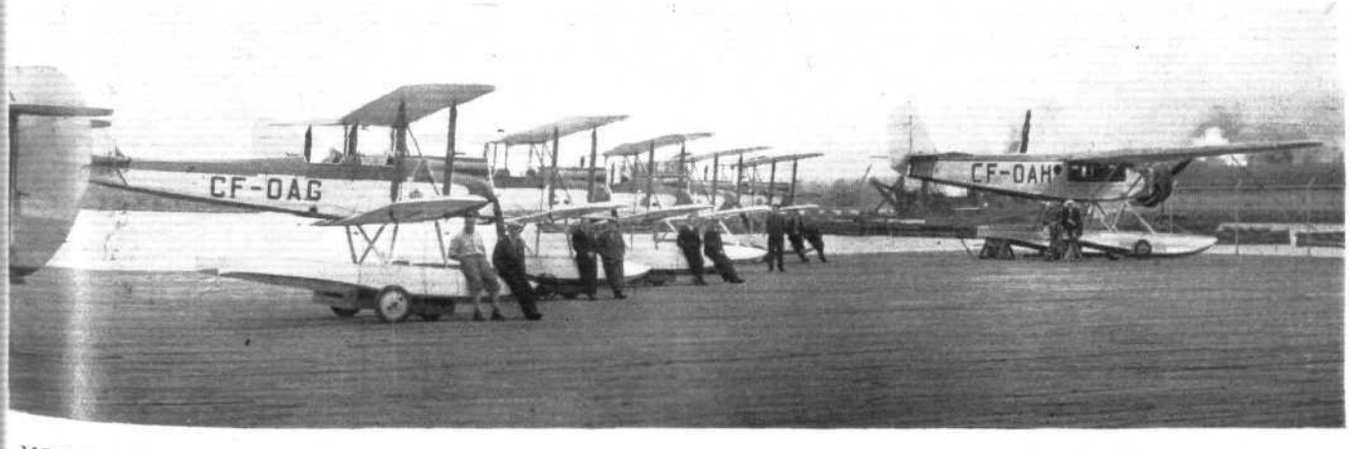
The following appointments have been made by the Admiralty :—

Lieutenants : F/O. R.A.F.—J. Wyatt Hale, to *Courageous*; and H. A. Traill, to *Victory* (8.1.31).

◈ ◈

Anti-aircraft Pawns

IT is reported in the *Morning Post* that Dr. Lasker and other past masters in the art of playing chess, have recently suggested methods of increasing its complexity of extending the board so as to bring in a new piece combining the powers of the queen and knight, but more up-to-date and in keeping with the type of gospel we ourselves are always preaching, is that the chess men should be made to take to the air. This suggestion comes from Peru and is in effect three dimensional chess. Above the chess board is placed an upper board of glass bearing the same number of squares, on which pieces move representing an attack from the air, the piece representing Bombardment moves like a Rook; Attack like a Bishop; Pursuit like a Knight; Local Observation as the King and Distant Observation like the Queen. The Pawns on the lower board have the power of anti-aircraft guns and make the square above them untenable. A piece may be captured from above and it is possible for the King below to be checkmated by his aerial enemies. No doubt the Peruvian aeronautical experts have more time for such fascinating pastimes than have ours in this country.



MOTH SEAPLANES IN CANADA: **Some of the 14 D.H. Moth Seaplanes used by the Ontario Provincial Air Services, which have completed 9,297 hr. 45 min. flying during 12 months' operations last year. The machine on the right is a Hamilton all-metal monoplane.**

MODELS

THE MODEL AIRCRAFT CLUB
(T.M.A.C.)

THE indoor flying meeting at the Horticultural Hall on Wednesday, January 7, proved to be the most successful that has been held, both on account of the large number of members who were present and for the large variety of models flown.

It would be impossible adequately to describe any of the models, or to give due credit to the designers of some truly wonderful models, which were extremely attractive in appearance and flew like full-sized machines.

Beautifully streamlined racers with sporting racing colours flashed past each other in the air down the hall, whilst high above, circled fuselage and spar machines which weighed but a fraction of an ounce each.

A race between a miniature racing car and a fast-model aeroplane was an added attraction; the comparative speeds could only be judged at the start, for the aeroplane took the air a yard or so from the starting line, leaving the car to continue its unerring course at great speed across the floor of the hall.

Visitors from the provinces who had made the journey specially to see the flying, were delighted with the display, and showed keen interest in the machines on view.

The experience gained at these indoor meetings has proved of great value to members; they are enabled to carry out experiments with new types of models, and it is not difficult to foresee that there will be some advanced designs of model aircraft making their appearance in the very near future.

Wimbledon Section.—Saturday, January 10, found the common fog-bound and the few members that attended stayed only for a short while. Sunday morning, the 11th, started off with bright sunshine and members arrived early to compensate for the previous day. Altitude and distance were the salient features of the day. Mr. Peters, however, making a time of 85 sec. on one of his flights. Mr. Willis, in his inimitable style, was achieving all three of the best points—altitude, distance and duration. Master Willis was sending his lightweight to the other side of the common together with Master Gordon's heavier brother. With the afternoon came the high winds, reaching gale force at times. Mr. White brought along a new 4-ft. span high-wing monoplane and very pluckily sent her off for a maiden flight. The most noticeable point in regard to this large machine was its high rate of climb. The gusty wind made the flying more interesting for the spectators but it spelt disaster for some of the models. Mr. Gibson being one of the victims. A good many members attended and continued their sport until darkness fell. An extra special field-day is expected on Sunday, the 18th, when the Wimbledon Section will become a recognised wing of the T.M.A.C. under the able leadership of Mr. A. T. Willis.—A. E. Jones, Hon. Secretary, 48, Narcissus Road, West Hampstead, N.W.6.

BOURNEMOUTH MODEL AIRCRAFT SOCIETY

New Members.—The following new members have joined the Society: Mr. W. E. Rebbetts, Boscombe; Mr. A. S. Feltham, Christchurch.

Flying Activity.—Flying took place each week-end during December. Although weather conditions were far from ideal, some very good flights were made and valuable knowledge gained by the members' persistency. Mr. Baster's light Balsa-wood monoplane has proved itself extremely efficient and remarkably stable in the air. The secretary's modified Pelly-Fry model also flew well at times; its durations were, however, very short. At one of the try-outs, some very interesting stunt flying was observed. An investigation showed that a "flexible spar" was responsible for the display. W. Ives had his geared-spar model out on several occasions.

Meetings, etc.—On Sunday, December 7, Messrs. W. Ives, M. Hunt, S. Williams, and the hon. secretary, Mr. H. F. Weller, visited Brooklands in order to witness the flying display given by the London clubs. Although the weather was exceedingly unkind to them, the members concerned thoroughly enjoyed the show put up and greatly appreciated the welcome reception given them by the secretary and members of the S.M.A.E.

Indoor Meeting.—A very successful and interesting meeting was held at the residence of Mr. G. Baster on December 19. Mr. M. Hunt exhibited his scale model, which was much admired. Flying models were shown by Mr. A. Coach, G. Baster, and H. F. Weller. The models of the two latter members were used for the purpose of comparing English and American methods of construction. W. Ives contributed some interesting information concerning his experiments with small electric motors, and concluded by promising to give members details of any further development.—Hon. Secretary, 18, Madison Avenue, Bournemouth.

⁂ ⁂ ⁂ ⁂

IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.
For 1912 and 1913, see FLIGHT for January 17, 1914.
For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1929 being given in FLIGHT, January 17, 1930.

	Imports.		Exports.		Re-exports.	
	1929.	1930.	1929.	1930.	1929.	1930.
	£	£	£	£	£	£
Jan.	2,852	2,987	74,307	147,935	100	—
Feb.	6,532	2,460	195,369	226,049	2	1,000
Mar.	1,210	744	204,664	156,098	90	802
April	5,816	2,959	186,477	213,390	115	79
May	4,706	11,706	243,549	158,460	1,245	2,550
June	9,304	15,029	144,817	252,443	750	1,060
July	6,961	14,216	139,695	170,594	—	938
Aug.	16,706	5,382	160,625	146,564	4	6,912
Sept.	510	2,757	237,303	109,363	9,686	1,730
Oct.	6,226	3,502	297,879	140,225	1,370	355
Nov.	5,993	13,849	117,858	162,116	24,063	1,000
Dec.	2,649	3,541	163,002	167,697	819	499
	69,465	79,132	2,186,607	2,050,934	38,244	16,925

⁂ ⁂ ⁂ ⁂

PUBLICATIONS RECEIVED

Thermometric Lag of Aircraft Thermometers, Thermographs, and Barographs. By H. B. Henrickson. Research Paper No. 222. U.S. Department of Commerce. Superintendent of Documents, Washington, D.C., U.S.A. Price 10 cents.

How to Become an Air Pilot. New and Revised Edition. By R. L. Preston. London: Sampson, Low, Marston and Co., Ltd. Price 3*s.* 6*d.* net.

Whitaker's Almanack, 1931. *Complete Edition.* London: J. Whitaker and Sons, Ltd. Price 6*s.* net.

The Journal of the Royal Aeronautical Society, with which is incorporated the Institution of Aeronautical Engineers. No. 240. Vol. XXXIV. Dec., 1930. Price 3*s.* 6*d.*

Junkers Illustrated Date Calendar, 1931. Trost Brothers, 104, Victoria Street, London, S.W.1.

⁂ ⁂ ⁂ ⁂

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motors. The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1929

Published January 15, 1931

18,399. E. L. KRISTOFERSEN. Screw propellers. (340,000.)
31,156. H. JUNKERS. Prime movers having two positively interconnected crankshafts. (340,066.)
35,864. R. T. BENTHALL. Gyroscopic stabilising apparatus. (340,105.)

FLIGHT, *The Aircraft Engineer and Airships.*
36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telephone (2 lines): Holborn, 3211.
Holborn, 1884.
Telegraphic address: Truditur, Westcent, London.